



## Maintenance Information Manual

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**5211**

## Printer Theory - Maintenance Volume 2

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SECTION 15: THEORY OF OPERATION

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INTRODUCTION

The IBM 5211 Printer is a line printer using belt technology. The print belt, a 1219 mm (48 in.) steel belt, has 192 characters at the top of the belt and timing marks at the bottom. Printing is done by driving the hammers against the back of the paper and ribbon and against the moving print belt. See A. The print line has 132 print positions that are spaced 10 characters per inch.

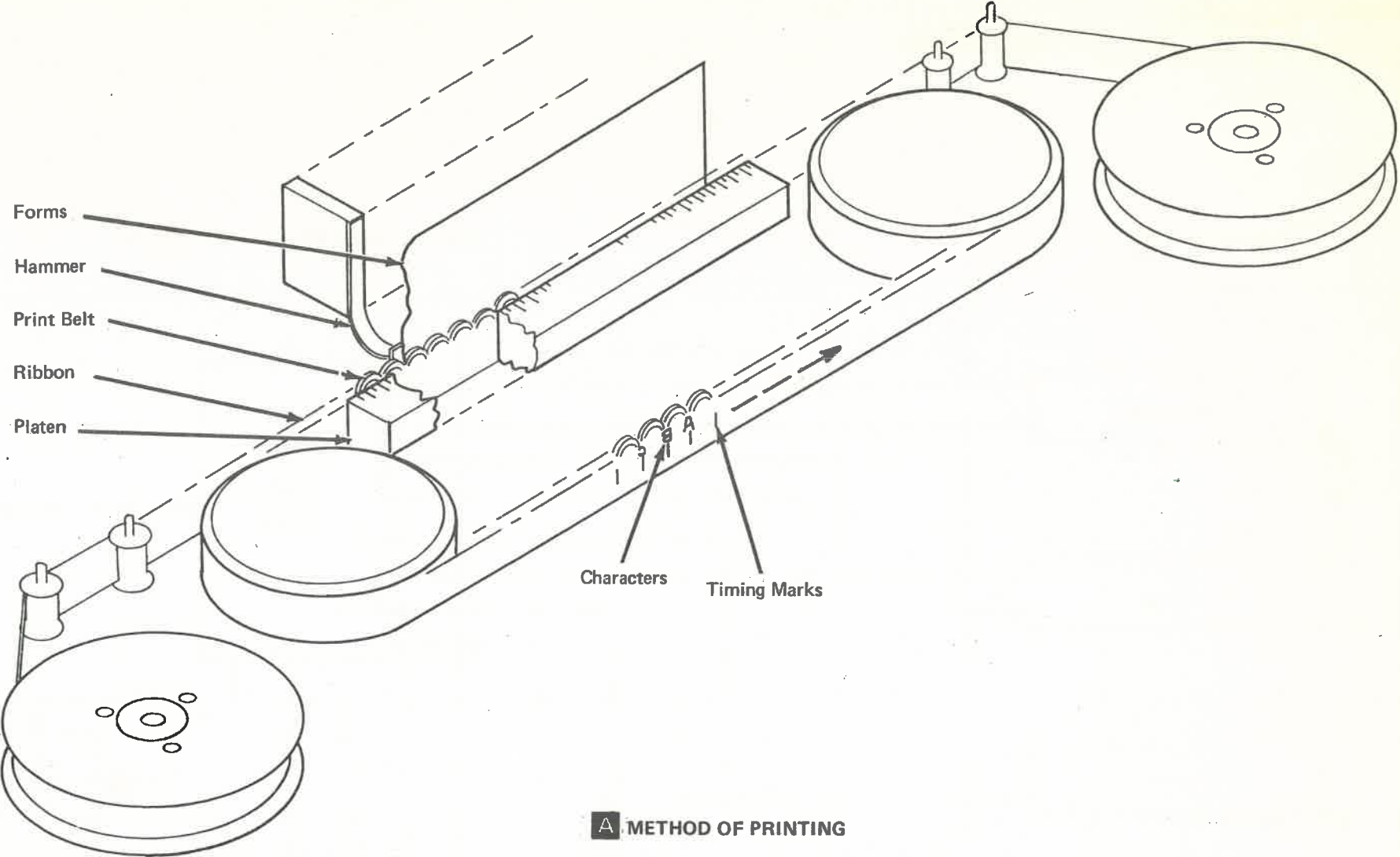
There are two Models of the IBM 5211 Printer:

- Model-1 has 66 hammers, one for two print positions. Each hammer is optioned twice for each print position.
- Model-2 has 132 hammers, one for each print position. Each hammer is optioned once for each print position.

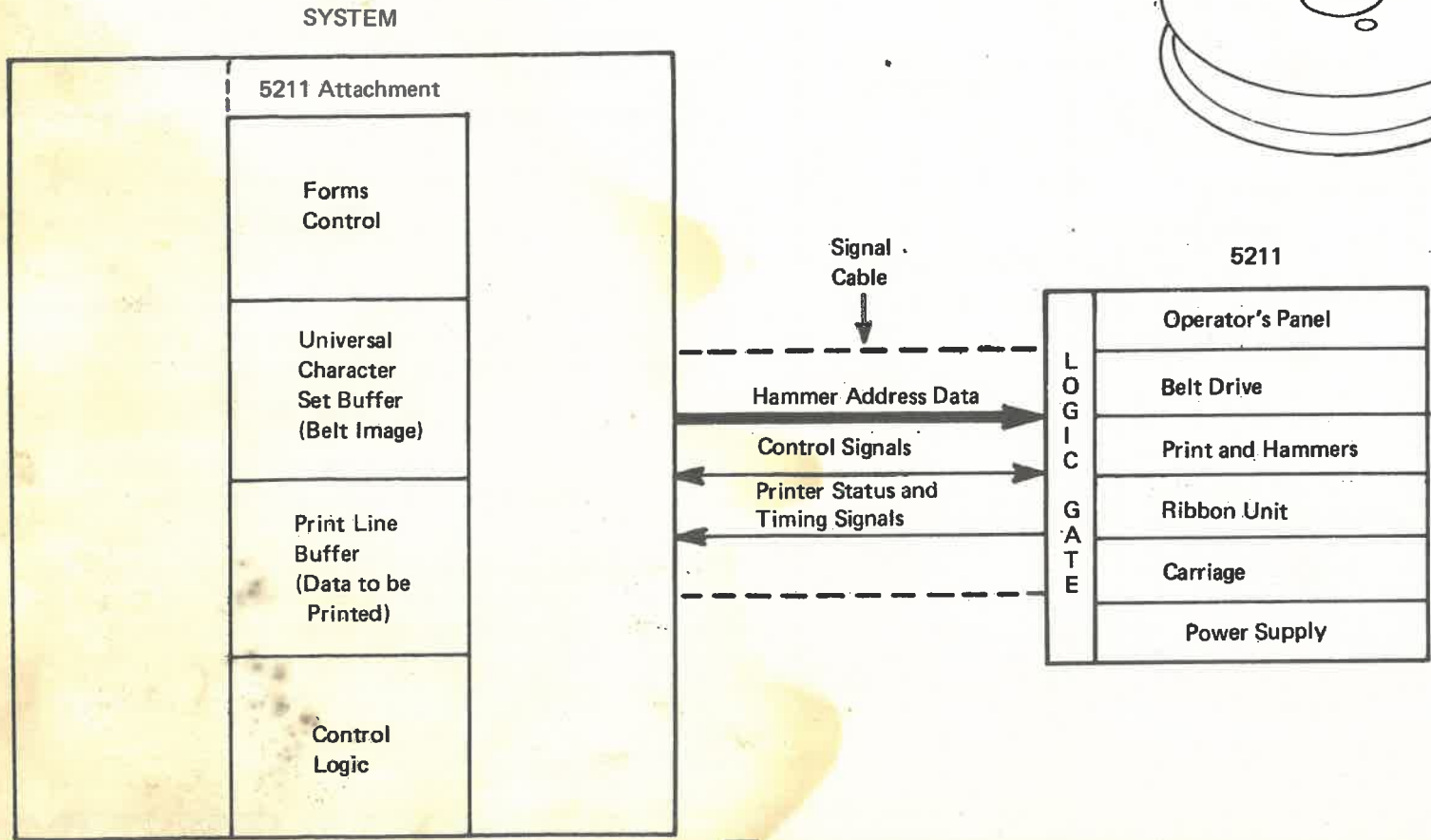
Characters per character set	Character sets on each belt	Print Speed (lines per minute)	
		Model-1	Model-2
48	4	160	300
64	3	120	235
96	2	84	164

Carriage spacing and skipping is controlled by the system at either 6 lines-per-inch or 8 lines-per-inch (6LPI/8LPI).

The printer attaches to the system through the signal cable and the 5211 attachment. See B. For detailed information, see "Attachment to System", 15-020.



A METHOD OF PRINTING



B ATTACHMENT TO THE SYSTEM

ATTACHMENT TO SYSTEM

DESCRIPTION

The IBM 5211 Printer attaches to the using system via a signal cable connected to the system's 5211 Printer Attachment. The printer attachment logic is located in the system. The printer logic and driver circuits are located on the printer logic gate in the printer.

The attachment contains 3 functional units that are needed to control the operation of the printer.

Forms Control Buffer (FCB) A

The Forms Control Buffer is loaded with the number of lines that are on the forms to be used. The line count is updated as the carriage moves the forms. This takes the place of the carriage tape.

Print Line Buffer (PLB) B

The Print Line Buffer is loaded with the data to be printed.

Universal Character Set Buffer (UCSB-Belt Image) C

The UCSB is loaded with the 192 characters that are on the print belt. The data to be printed is compared with the belt image characters in the UCSB for hammer addressing.

System D

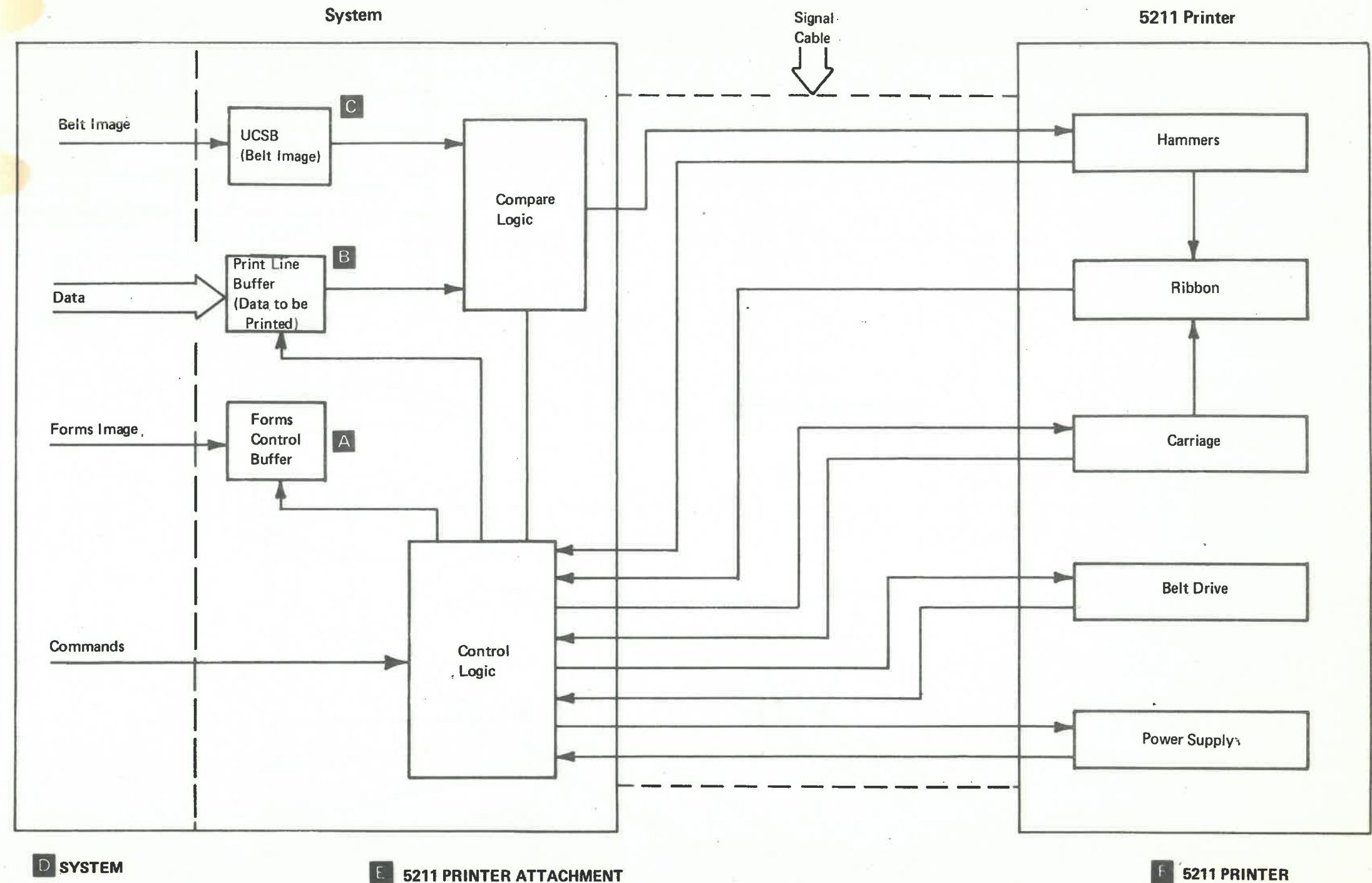
The System contains the control program and the attachment controller. The System sends printer commands and data to the printer attachment.

5211 Printer Attachment E

The Printer Attachment contains control and checking logic for itself and the printer. It generates signals to run the belt and carriage motors, address and fire the hammers, and activate the lights on the operator's panel.

5211 Printer F

The Printer contains functional units consisting of the print belt, ribbon, hammers, carriage, and power supply, in addition to the logic and driving circuits to operate these units. It also contains circuits for feedback to the attachment, error checking, and other special printer circuits, such as the CE Switches.





FUNCTIONAL UNITS AND DATA FLOW

Belt Motor and Drive A

The belt drive includes the belt motor, belt feedback, belt, belt pulleys, Print Subscan (PSS) emitter, and control logic. Its function is to move the belt in front of the hammers at a near-constant speed. The 'Belt Go' signal from the system generates the first motor advance pulse to start the belt motor. The motor is first detented, then it starts turning. After the motor starts turning, feedback pulses from the belt motor feedback circuit are used to generate additional motor advance pulses to keep the motor turning and accelerating. When the motor reaches a certain speed, as measured by the frequency of the feedback pulses, the motor advance control switches to the 4 MHz oscillator. When the belt is up to speed, (home and PSS pulses generated from the belt timing marks), the signal 'Belt Up to Speed' is sent to the system.

See "Print Belt and Drive", 15-070.

Print Subscan (PSS) Pulses and Home Pulses B

These pulses are generated from the timing marks on the print belt as it moves past the PSS emitter. Two PSS pulses are generated from each timing mark on the belt. One home pulse is generated for each home position (missing timing mark) on the belt. There is one home position for each character set on the belt.

After the signal 'Belt Up To Speed' is active, the PSS and home pulses are sent to the system. The system synchronizes itself to the printer with the home pulses. The system uses the PSS pulses to synchronize the characters on the belt to the correct hammers for printing. See "Print Subscans and Home Pulses", 15-140.

Print Unit and Hammers C

The print unit includes the print belt drive, platen, ribbon, and forms thickness control. The hammer unit includes all the hammers and hammer coils. The print unit positions the platen, the print belt, and the ribbon in front of the hammers. The forms thickness control adjusts the printer to print on different forms thicknesses by:

- 1. Changing the gap between the platen and the hammers.
  - 2. Changing the duration of the hammer drive pulses.
- See "Print Unit and Hammers," 15-150.

Ribbon Drive D

The ribbon drive includes the ribbon motors, reels, ribbon reversing switches, and control logic. The ribbon drive moves the ribbon horizontally across the print line. The ribbon moves during both printing and carriage operations. The ribbon is driven by either the right or the left drive motor under control of the ribbon reverse switches. A small current, called the ribbon-drag current, is applied to the non-driving motor to hold tension on the ribbon.

See "Ribbon", 15-220.

Paper Clamp E

The paper clamp, located under the print unit, has a magnet that operates a clamp bar. The clamp, when activated, holds the forms tightly against a guide under the hammers to prevent horizontal movement of the forms while printing. The system activates the paper clamp before and during printing, then deactivates it before the carriage moves the forms.

See "Forms Path", 15-250.

Carriage F

The carriage includes the carriage motor, tractors and control logic. The carriage moves the forms through the printer under system control. After the paper clamp releases the forms, the system activates the 'Carriage Go' Signal. The printer logic then generates the first carriage advance pulse to start moving the carriage motor. After the motor starts turning, feedback pulses from the carriage motor feedback generate additional carriage advance pulses that advance the motor and also signal the system that the carriage moved. The system counts the advance pulses to determine how far the carriage has moved. When the carriage has moved the distance specified in the forms command, the system deactivates 'Carriage Go'. The 5211 then generates three stop pulses to slow the carriage motor down before stopping it. A small detent current holds the carriage motor in the stopped position.

See "Carriage", 15-270.

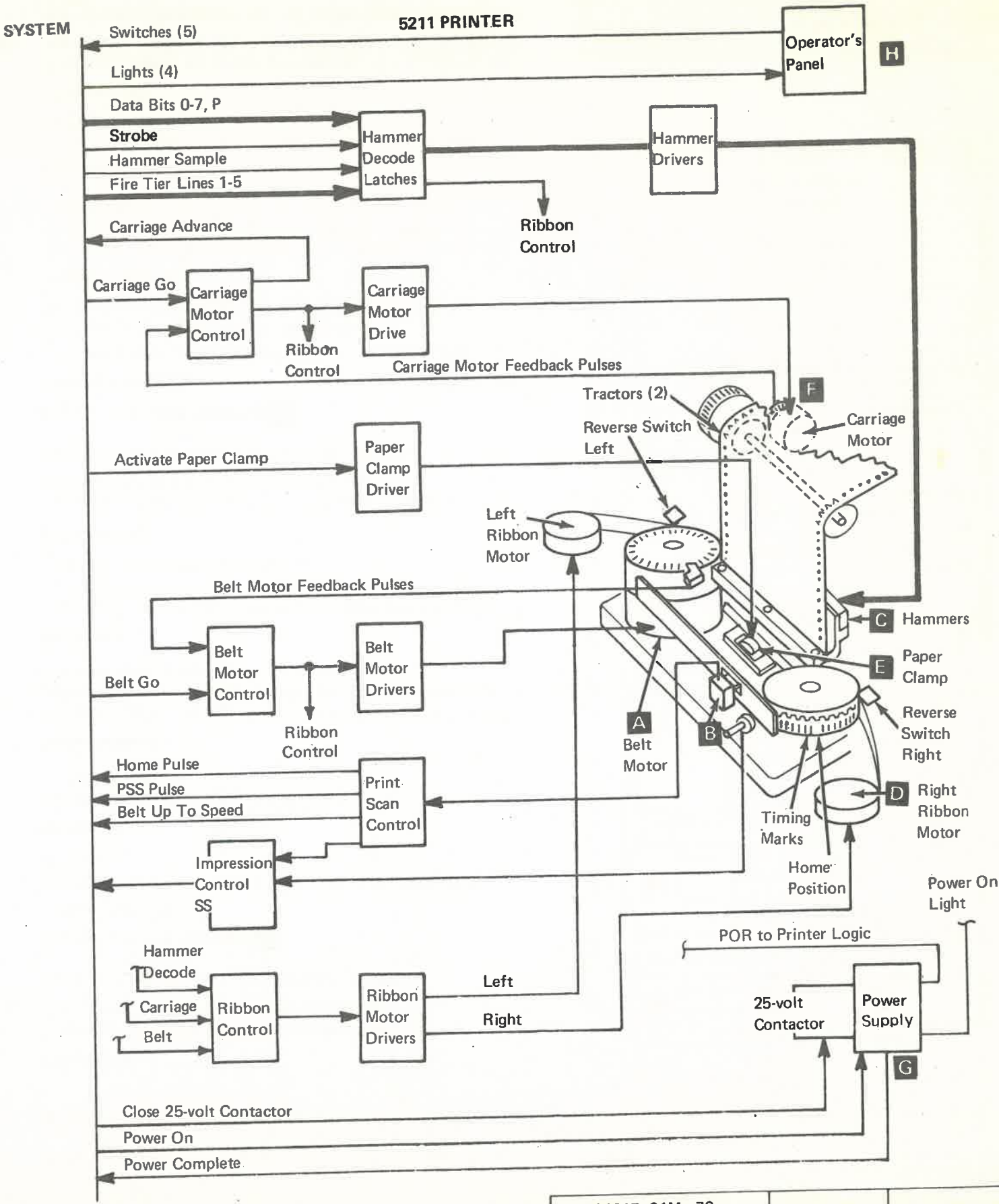
Power Supply G

The power includes the primary section, the secondary section, and the distribution. The power supply converts the ac line voltage to dc voltages to operate the printer. The system normally controls the power supply in the 5211. The system activates the 'Power On' signal to turn on the printer power. When the power supply determines that the dc voltages are correct, it sends a 'Power Complete' signal to the system. The system then sends the 'Power On Reset' signal to the printer logic, followed by the 'Close 25-volt Contactor' signal.

See "Power Supply", 15-340.

Operator's Panel H

The operator's panel enables communication with the system. The signals from the four keys and the 6LPI/8LPI switch go to the 5211 logic then to the system. The Power light is turned on by the printer power supply. The Ready light is turned on by the system. The Check, Interlock, and Forms lights flash on and off continuously when activated by the system.





5211 PRINTER/SYSTEM SIGNALS

- The signals between the 5211 Printer and the System's Printer Attachment are described on this page.

Power A

Power On

This signal from the host system, turns on the 5211 power supply. When deactivated, it turns off the 5211 power supply.

Power Complete

The printer sends this signal to the system when all the voltages in the printer are correct.

Power On Reset (POR)

The system activates this signal to reset the printer logic circuits when turning power on, turning power off, and when certain errors occur.

Close 25-volt Contactor

The system activates the 25-volt contactor in the printer to distribute 25-volt power to the printer motors, hammer coils, and paper clamp magnet circuits.

Power Check

The power supply in the printer sends this signal to the host system when any failure occurs in the power supply.

For additional information, see "Power Supply", 15-340.

Interlocks B

Cable Interlock

The signal starts in the system, then goes through six signal cable connectors; (3 at the system, and 3 at the printer) and 1 at the Printer Operator's Panel. If the circuit cannot be completed, the system activates the signal. The signal, when active, indicates that a cable connector is not seated correctly or is in the wrong position.

For additional information, see "Operator's Panel," Section 3, 3-000.

Print Unit (Throat) Closed

This signal from the printer indicates that the print unit casting is closed and that the print belt cover is installed.

Belt Drive and Subscan Control C

Belt Go

This signal, from the system, activates the belt motor control circuits to run the belt motor. When deactivated, the belt motor stops.

Belt Up To Speed (BUTS)

This signal, when activated by the printer, indicates that the belt has reached operating speed. The system must receive this signal within 1.4 seconds after 'Belt Go' is active.

Print Subscans (PSS)

These signals from the printer are generated from the belt timing mark. The system uses these pulses to synchronize the characters on the belt to the correct hammer for printing.

Home

This signal from the printer is generated when a home position is sensed from the belt (one of the missing timing marks). The system uses the home pulse to synchronize itself to the printer.

For additional information, see "Print Belt and Drive," 15-070 and "Print Subscans and Home Pulses," 15-140.

Hammer Addressing and Firing D

Impression Control Single Shot

This signal from the printer has different time periods depending on the position of the forms thickness control. The system uses the pulses to change the length of the fire tier (hammer fire) pulses.

Data Bits 0-7, P

These signals from the system go to the hammer address decode circuits to turn on the correct hammer latch when 'Strobe' is active.

Strobe

This signal from the system gates the hammer address through the decoder to turn on the hammer latch in the printer.

Data Parity Check

This signal indicates to the system that the printer has sensed even parity from the data bits.

Fire Tiers 1-5

These 5 hammer-fire pulses from the system activate the hammer driver to fire the hammer if its corresponding latch is turned on. The pulses follow in sequence, Fire Tier 1, Fire Tier 2, and so on. The time duration of the pulse is changed by the impression control single shot.

Hammer Sample

The system sends 133 pulses (1 sync, followed by 132 sample) to the printer to sense which hammers are on.

Hammer Echo Return

These signals from the printer are returned to the system for each hammer sensed on by the hammer sample pulses.

Not Print Time

The printer signals the system that no data is being transmitted following printing to run the ribbon and to verify for an "Any Hammer On" condition.

For additional information, see "Print Unit and Hammers," 15-150.

Ribbon E

Printer Busy

The printer signals the system when the printer senses a ribbon reverse or too much belt speed variation. The system stops sending 'Data Bits' and 'Strobe' when 'Printer Busy' is active.

Ribbon Check

The printer signals the system that a ribbon motion or ribbon reverse failure was sensed by the printer.

For additional information, see "Ribbon", 15-220.

Forms Path and Carriage F

Activate Paper Clamp

The system activates the paper clamp to hold the forms when printing.

Carriage Go

The system activates the carriage motor control circuits to run the carriage motor.

Carriage Advance

The printer sends a carriage advance pulse to the system each time the carriage motor is advanced. The system counts the pulses to determine how far the carriage has moved.

Forms Pulse

The printer sends this pulse to the system each time a feed hole is sensed at the left tractor. The system uses the pulses to determine if forms movement is correct.

End-of-Forms

The printer signals the system that the end-of-forms switch has sensed the end of the last form in the printer.

For additional information, see "Carriage", 15-270.

Lights, Keys, and Switches G

Operator Panel Lights

The system turns on the respective light on the Printer Operator's Panel. (Check, Interlock, Forms, or Ready).

For additional information, see "Operator's Panel," 15-050.

Operator Panel Keys

Each signal from the printer stays active as long as the respective key is pressed. (Carriage Restore, Carriage Space, Ready, or Stop/Reset).

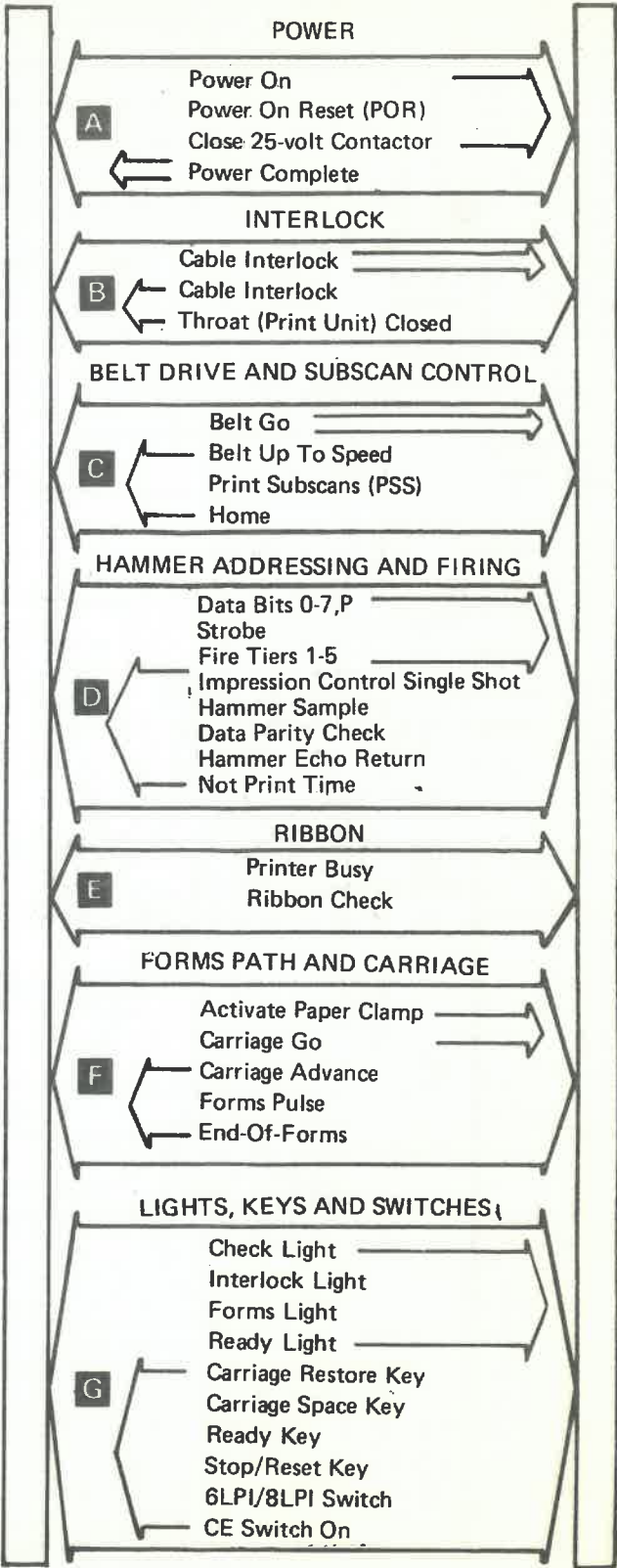
6LPI/8LPI Switch

The printer signals the system that the operator wants forms spacing at either 6 or 8 lines per inch.

CE Switch On

The printer signals the system whenever any of the 4 CE switches are turned on. (BELT GO, CARR, RIBBON, or PAPER CLAMP).

For additional information, see "CE Switch Panel", Section 2, 2-000.





OPERATOR'S PANEL

GENERAL DESCRIPTION

The 5211 Operator's Panel enables communication with the system. The signals from the four keys and the 6LPI/8LPI switch go to the 5211 logic then to the system. The Power light is turned on by the printer power supply. The Ready light is turned on by the system. The Check, Interlock, and Forms lights flash on and off continuously when activated by the system.

The Operator's Panel has a light panel assembly and a key panel assembly located under the cover. The 6LPI/8LPI switch is in the base of the Operator's Panel. The light panel circuit board has five light-emitting diodes (LED's) and their drivers. The key panel circuit board has 4 elastic-diaphragm switches (EDS) that are closed by pressing their respective key.

For removal and installation, see "Operator's Panel," Section 3, 3-000.

Interlock Light (Yellow)

The Interlock light indicates any of the following conditions:

- Print unit open
- Print belt cover not installed

The light is turned off by closing the print unit and/or installing the print belt cover.

Check Light (Yellow)

The Check Light indicates the system has detected any of the following printer error conditions:

• Belt up to speed check	• Printer busy too long check
• Belt sync check	• Printer busy too often check
• Belt speed check	• Ribbon check
• Data parity check	• Forms jam check
• Hammer echo check	• Carriage check 1
• Any hammer on check	• Carriage check 2

The Check light is turned off by pressing the Stop/Reset Key on the printer.

Forms Light (Yellow)

The Forms light indicates the system has detected one of the following forms conditions:

- End-of-forms
- Carriage check 1
- Carriage check 2
- Forms jam

The Forms light is turned off by pressing the Stop/Reset Key on the printer.

Ready Light (Green)

The Ready light indicates that the printer is ready. It is turned on by the system when the Ready key is pressed and neither the Check, Interlock, nor Forms light are on. It is turned off by pressing the Stop/Reset Key, or by any condition that turns on the Check, Interlock, or Forms lights.

Power On Light (Red)

The Power On light indicates that the printer power supply is active. It is turned on by the 5211 Power Supply. It is turned off when the +5-volts is not active in the 5211 Power Supply.

Stop/Reset Key

This key has two functions:

1. Stop. When the printer is ready, pressing this key sends a signal to the system that the operator wants to stop the printer. The system stops the printer after the program operation is completed. The ready light is turned off and the printer is made not ready.
2. Reset. When the Check or Forms light(s) is on, pressing this key sends a signal to the system to reset the light(s). The system then turns off the Check and/or the Forms light(s).

6LPI/8LPI Switch

This switch sets forms spacing to either 6 lines-per-inch or 8 lines-per-inch.

Carriage Restore Key

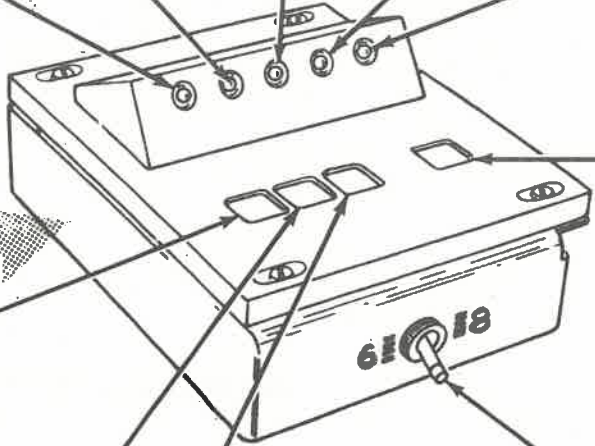
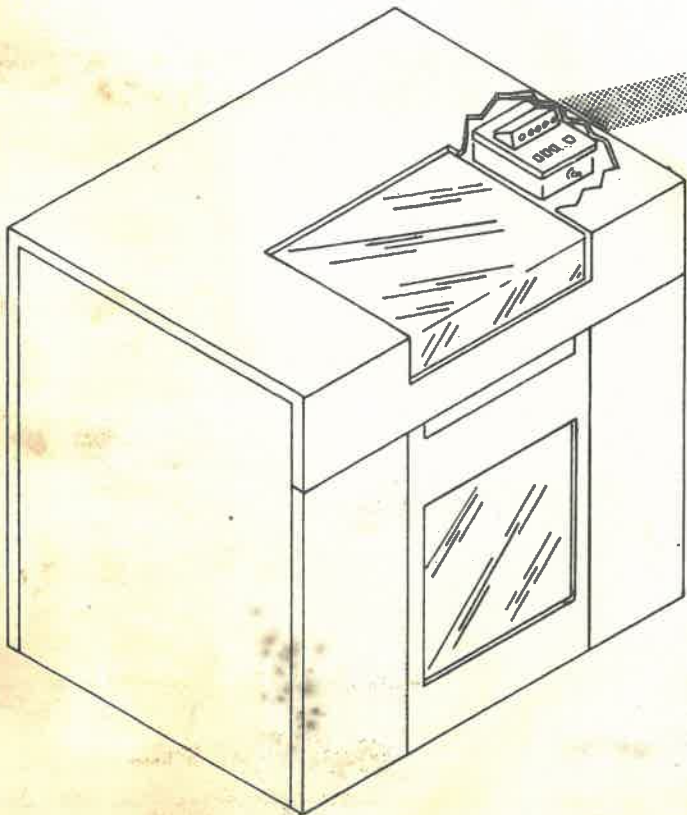
Pressing this key advances the forms to the first line to be printed. The key is active only when the printer is not ready.

Carriage Space Key

Pressing this key advances the forms one line space, 1/6 or 1/8 inch, depending on the position of the 6LPI/8LPI switch. The key is active only when the printer is not ready.

Ready Key

Pressing this key signals the system that the printer is ready for operation. The system then turns on the Ready Light, and starts the belt motor. The key is not active if either 'Interlock' or 'Printer Busy' is active.



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# PRINT BELT AND DRIVE

*NOTE:* For all removals, installations and adjustments, see Section 4,4-000.

## PRINT BELT DRIVE

The print belt drive starts the belt moving, accelerates it up to speed, and maintains the belt speed. The theory of how this is done follows.

### Start Print Belt Motor

'Belt Go' from the system causes the print belt motor to detent. At the end of detent time, the motor starts.

### Acceleration and Running Speed

The print belt motor speed continually increases until the motor feedback pulses which have been driving the motor, indicate that the motor is up to speed. Belt control then switches from the feedback pulses to pulses generated by a 4 megahertz oscillator.

### Belt Synchronization With CPU or Host System

'Home Pulses' from the timing marks on the print belt synchronize the characters on the print belt with the print control unit Universal Character Set Buffer. (UCSB) This buffer in the system contains the character image of the print belt.

### Error Checking

Print belt alignment, speed, breakage and synchronization with the system are monitored by the use of the Home and Print Subscan (PSS) pulses. Failures drop 'Ready' and require operator interruption.

## PRINT BELT DRIVE MECHANISM

The print belt and drive mechanism is designed to move the print belt at an even speed past the print line. The mechanism also allows easy replacement of print belts.

### Motor and Drive Pulley

The print belt drive motor, located on the left end of the print unit, is a vertically mounted stepper motor which turns the drive pulley **A** counterclockwise. The motor is driven in four different stages:

1. Detent
2. Start
3. Accelerate
4. Run

The pulley is free to float vertically on the motor shaft. This allows for the difference in flexibility of the belts. The cover over the drive pulley limits the upward movement. See "Print Belt Drive Motor Control," 15-080, for the three stages of control of the stepper motor.

### Print Belt Positioning Rollers

The two positioning rollers **B** are located below and behind the drive and the idler pulleys.

The purpose is to limit the downward travel of the print belt. Because of the flexible differences between belts, the belt drive and the idler pulleys are free to float vertically on their shafts. See "Belt Positioning Rollers", Section 4-000, for installation.

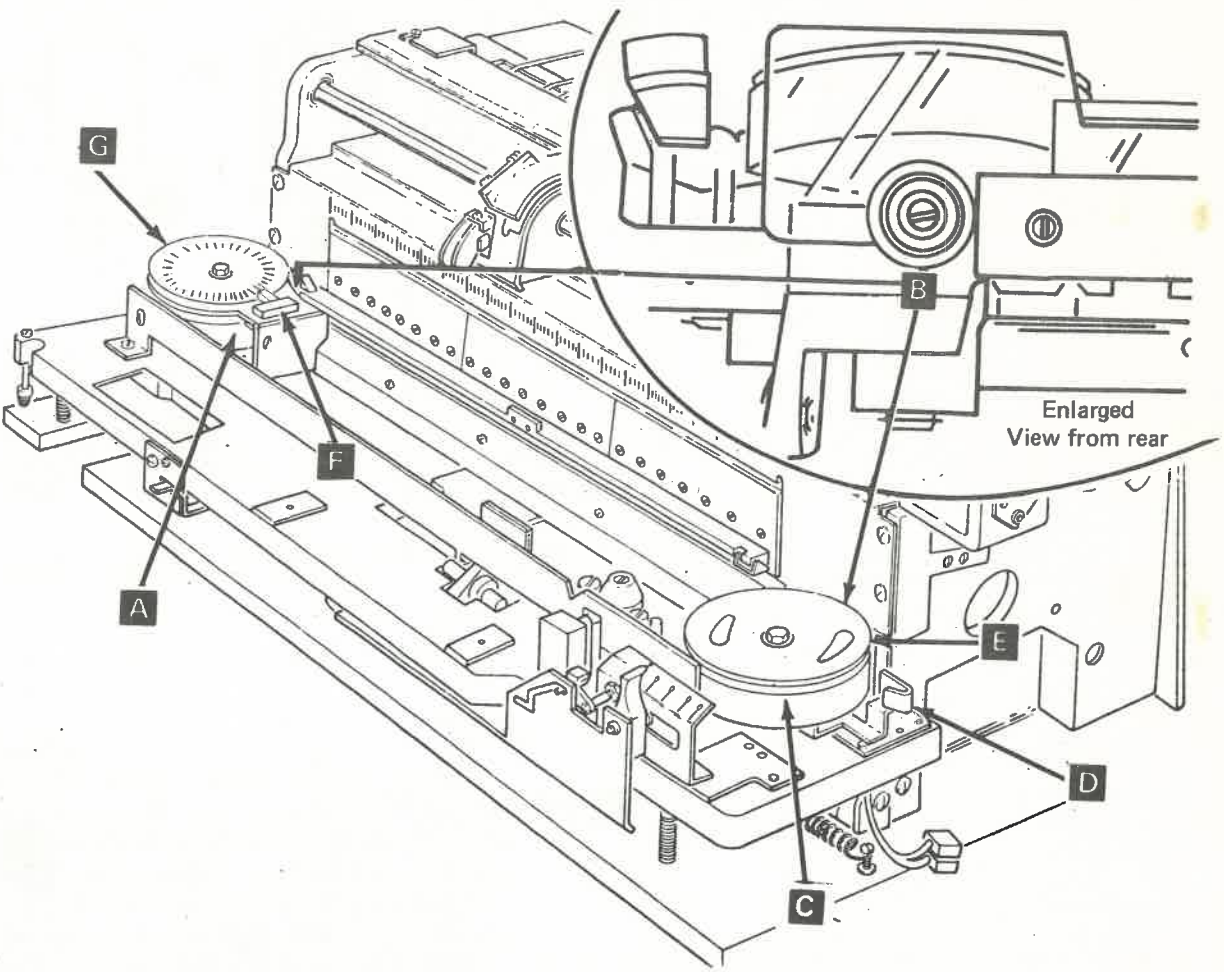
### Idler Pulley and Print Belt Release Mechanism

The idler pulley **C** provides tension to the right end of the print belt. Moving the print belt release lever **D** forward, moves the idler pulley to the left, releasing the belt. For adjustment of the belt idler pulley bracket, see "Belt Idler Pulley Bracket — Adjustment", Section 4, 4-000.

The cover over the idler pulley limits the upward travel of the idler pulley (See "Print Belt Positioning Rollers", 15-070. It also provides finger holes **E** for easier turning of the pulley by hand.

### Print Belt Motor Feedback

The feedback pulses are used to monitor the speed of the belt motor and to provide constantly increasing feedback pulses to drive the motor faster. The feedback LED assembly **F** senses the holes in the feedback timing disk **G**, by shining a light through the holes in the timing disk and sensing the light with a photo transistor circuit, which amplifies the signal. (See Section 18, ZA082.) This feedback pulse is used to accelerate the print belt motor to print speed. (See "Print Belt Drive Motor Control, Section 15-080) The feedback LED block can be adjusted to change the lead time of the pulses, thereby changing the speed of the stepper motor (during acceleration time only). See "Belt Motor Feedback LED-Adjustment", Section 4,4-000.



PRINT BELT DRIVE MOTOR CONTROL

The print belt drive motor and mechanism is used to move the print belt past the front of the hammers at a constant speed, to allow evenly spaced printing. Motor drive during these stages is through printer circuitry which uses a one megahertz pulse and a motor drive pulse to advance a two position ring. The ring produces A, not A, B, and not B pulses which are sent to a motor driver card to drive the print belt drive motor. See "Print Belt Drive Motor Control Logic", 15-130. The four stages of control (See "Motor and Drive Pulley", 15-070) generate 'Motor Drive' A as shown:

Detent	'Belt Go Control' until 'Belt Go Delayed'	J
Start	'Start Pulse'	B
Acceleration	'Feedback'	C
Run	'Gated Open Loop'	D

For timing relationships of the 4 stages, see "Print Belt Motor Control Timing", 15-120.

4 Megahertz Oscillator

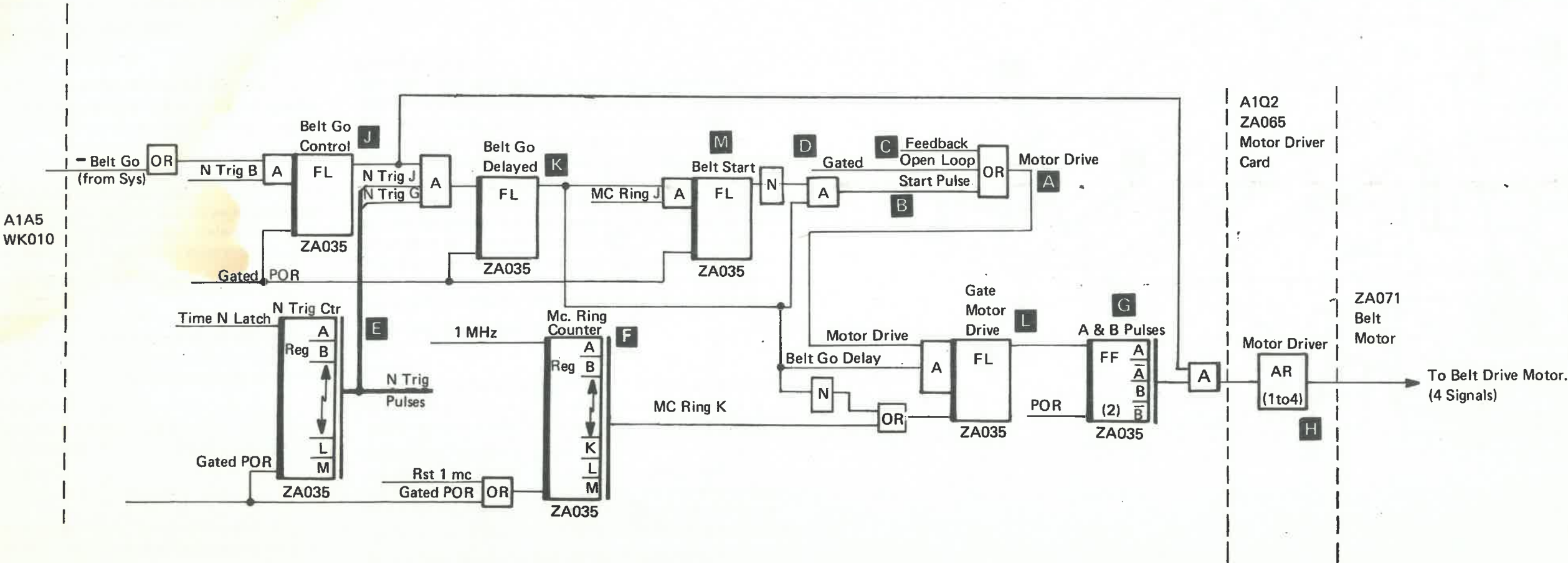
A 4 megahertz (MHz) oscillator, (See "Amplifier Card", Section 18, ZA030) starts when the printer is turned on, and it supplies 4 MHz, 1 MHz and .25 MHz pulses to various logic circuits. The 4 MHz oscillation starts an 'N' ring E that produces pulses approximately every 1.376 ms. These pulses are labeled 'N Trig A' through 'N Trig M'. The 1 MHz pulse starts an 'MC' ring F to produce pulses labeled 'MC Ring A' through 'MC Ring M'. These counters provide timing pulses internally to the belt control card. See "Belt Control", Section 18, ZA035.

Start Print Belt Motor (Start)

Belt Go Control J detents the motor to ensure counter-clockwise rotation with the start pulse and succeeding pulses. See "Print Belt Motor Control Timing", 15-120. Without this electrical detent, the motor might not turn in the correct direction. The motor can now be started from this detent position.

The objective in starting the motor is to activate 'Motor Drive' A to gate the A & B pulse 'FF' latches G, and to send a combination of A and B pulses to the Motor Driver card H to start the motor. See "Belt Motor", Section 18, ZA 071.

'Belt Go' from the system, along with an 'N Trig B' pulse activate the Belt Go Control latch J. 'Belt Go Control' with timing pulses 'N Trig J' and 'N Trig G' turn on the Belt Go Delayed latch K. 'Belt Go Delayed' allows the Gate Motor Drive Latch L to be set by 'Motor Drive', which is activated by 'Start Pulse'. 'Start Pulse' deactivates when the Belt Start latch M turns on at MC Ring J time. The Gate Motor Drive latch resets at MC Ring K time.





### Print Belt Motor Feedback Control (Accelerate)

The print belt drive stepper motor must accelerate to print speed within 1.4 seconds after 'Belt Go'. The belt control circuits monitor the speed during this time by using the belt motor feedback pulses. See "Print Belt Motor Feedback", 15-070. As the motor starts to turn, the feedback LED senses the first hole in the timing disk. This pulse, when amplified, sets the Feedback latch **A** at D3 time **B** (It will reset at the following D2 time.) 'Feedback Latch' and not 'Motor Up to Speed' (MUTS) are ANDed to give 'Feedback' **C**. These 'Feedback' pulses increase in frequency as the speed of the motor increases.

The Slow Latch **D** is turned on every 900  $\mu$ s by the 900 decode **E**. The Slow latch, when on, prevents the MUTS latch **F** from turning on and therefore allows the line 'Feedback' **C**.

However, when the frequency of the feedback pulses from the LED cause the Feedback latch to turn on *before* 900  $\mu$ s, the MUTS latch **F** *will* turn on. The Feedback latch will continue to turn on but its output is now degated by 'MUTS'.

### Gated Open Loop Control (Run)

The output of the Motor Up To Speed latch allows timing pulses from the '919 decode' **G** to set the Open Loop latch **H**. 'Open Loop' with '1Mc' becomes 'Gated Open Loop' which provides 'Motor Drive' and run mode.

### Belt Up To Speed (UTS)

'Belt UTS' to the System **J** indicates that the correct print belt speed has been reached. The 'Belt UTS Gate' had been set after start time and by the timing pulse 'N Trig K' **K**. The 'Belt UTS' latch can be set when these three conditions are active:

1. The PS and Home pulses are inactive. **L**
2. The motor is up to speed **M**
3. The belt is in motion, not installed **N**

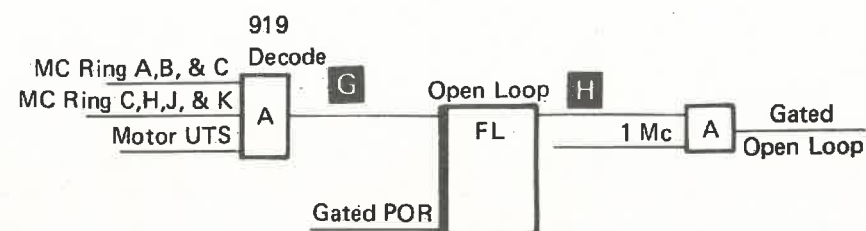
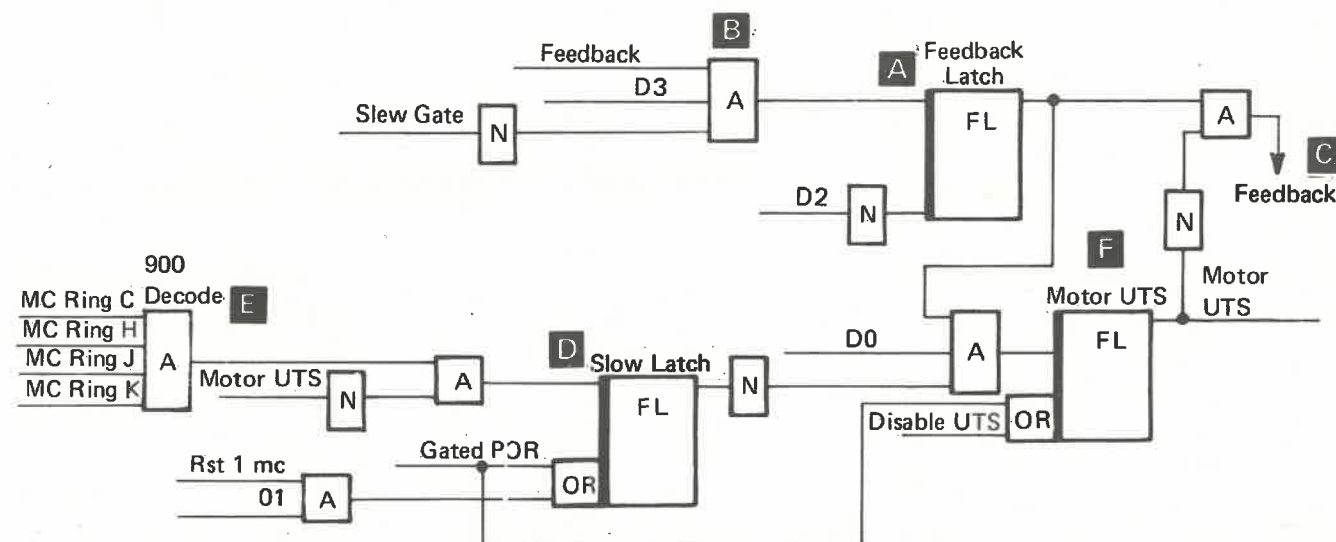
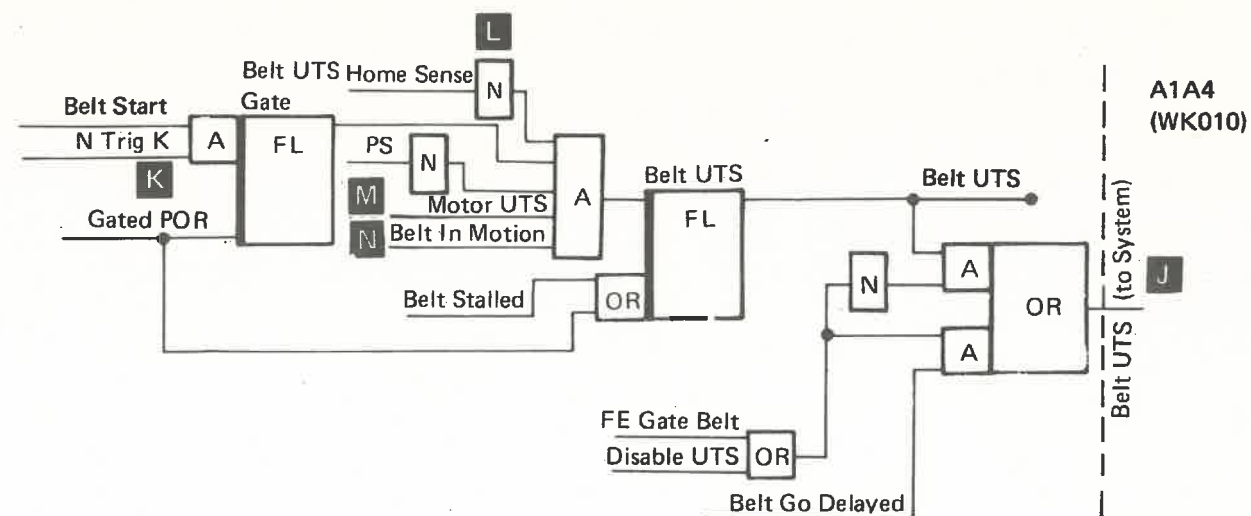
'Belt UTS' must be active within 1.4 seconds after 'Belt Go' is activated by the system.

Constant monitoring of the pulses from the PSS emitter is necessary to keep the printer operating. See "Belt Error Conditions", 15-110.

### Belt Synchronization With System

'Belt UTS' and 'Home Pulse' are sent to the system to indicate that printing can begin when the system and the printer are synchronized. Each character-set on the print belt has a missing timing mark which indicates home position. (Timing marks are raised vertical projections.) The 'Home Pulse' is sent to the system, along with the PSS pulses to synchronize each character on the print belt to the characters in the Universal Character Set Buffer.

A1N2 (ZA035)

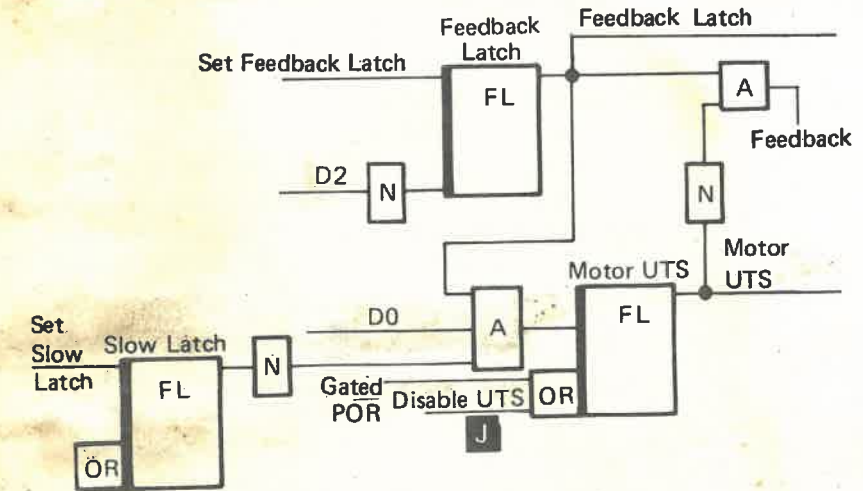
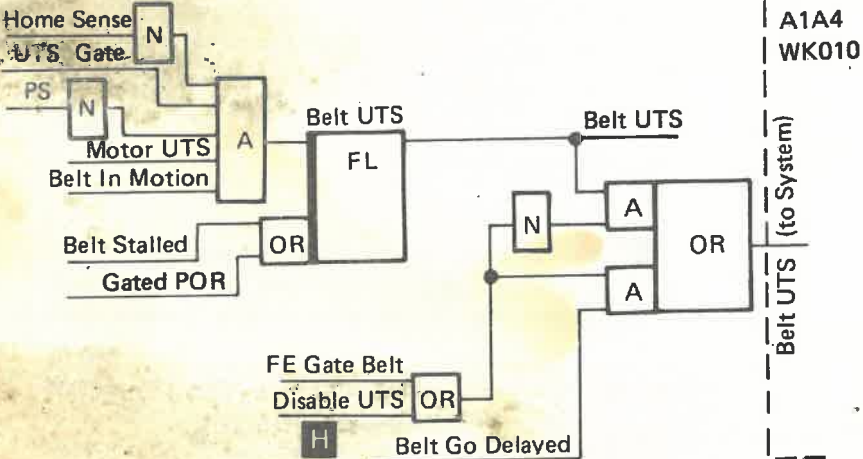




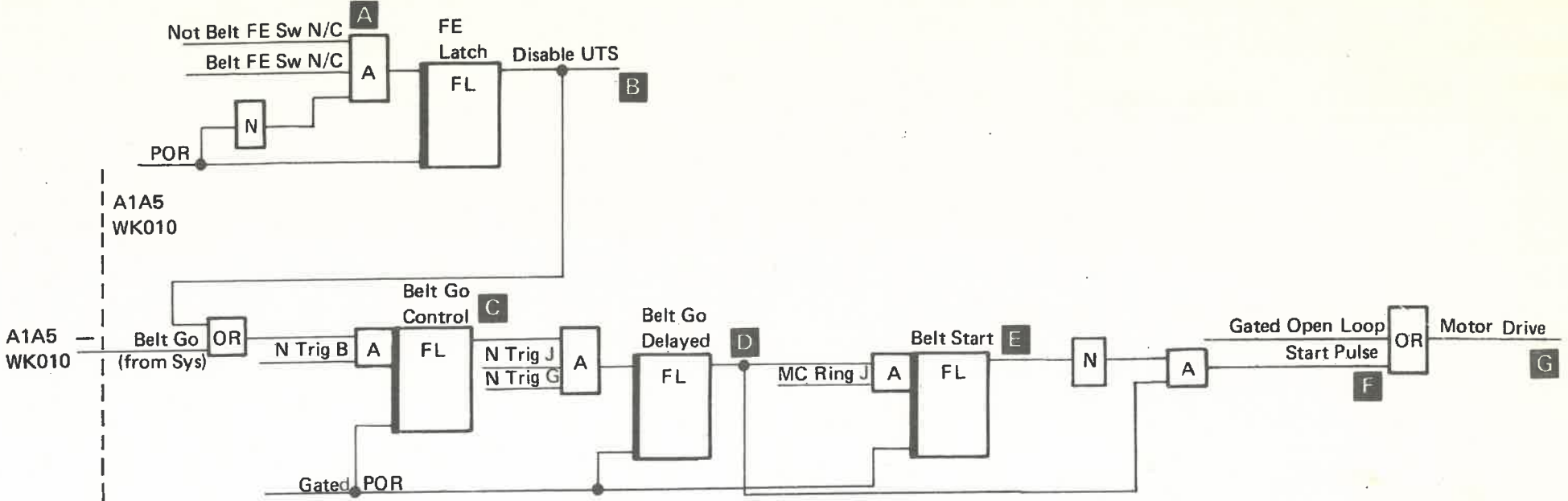
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CE Switch Control

CE switch 1 (Belt Go) is provided to test the print belt stepper motor for correct operation. CE switch 1 turns on the FE latch A which activates 'Disable UTS' B. This turns on the Belt Go Control C, Belt Go Delayed D, and the Belt Start E latches to activate 'Start Pulse' F and 'Motor Drive' G. The belt drive motor will now run continuously in closed loop mode. (This is the same as normal belt motor start). At the same time 'Disable UTS' degrades 'Belt UTS' H, and holds the 'Motor UTS' latch J reset.



A1N2 (ZA035)  
Belt Control Card



A1N2 (ZA035) Belt Control Card

PRINT BELT ERROR CONDITIONS

The PSS transducer senses belt timing marks, or the absence of timing marks in the case of 'home'. The PSS pulses are used to monitor the speed of the print belt, to produce 'home' and to produce the PSS pulses. There is a 'home position' (lack of a timing mark) for every 'character set'.

The PSS pulses are used for the following checks:

Error Condition Checks

The following problems cause error conditions, drop 'Ready' and require operator action. (The 'Ready' light comes on and the 'Check' light turns off, after the operator corrects the situation.) If the belt should break, lose speed or run crooked, printer 'Ready' drops. If the belt guide roller wears out, or the transducer of the PSS emitter fails, a sync check occurs and the printer drops 'Ready'.

Belt Up To Speed Check

'Belt Go' drops if the time between 'Belt Go' and 'Belt UTS' is longer than 1.4 seconds. After the error is 'logged' by the system program, a restart is initiated. A second restart with an error drops 'Ready' and requires operator action.

Belt Speed Check

This check drops 'Belt Go' if 'Belt UTS' becomes inactive when 'Belt Go' is active. Power On Reset (POR) is initiated and the DC contactor is dropped. ('Belt Up To Speed' is reset if the belt stalls.)

Belt Sync Check

A missing 'Home' pulse from the PSS emitter, or a mis-timed 'Home' pulse drops 'Belt Go'. This can happen if the belt breaks, or runs too fast or too slow.

Printer Busy Too Long Check

The 'Printer Busy' indication to the system must not exceed 3 seconds during a print cycle, or 'Belt Go' and printer 'Ready' drops.

Printer Busy Too Often Check

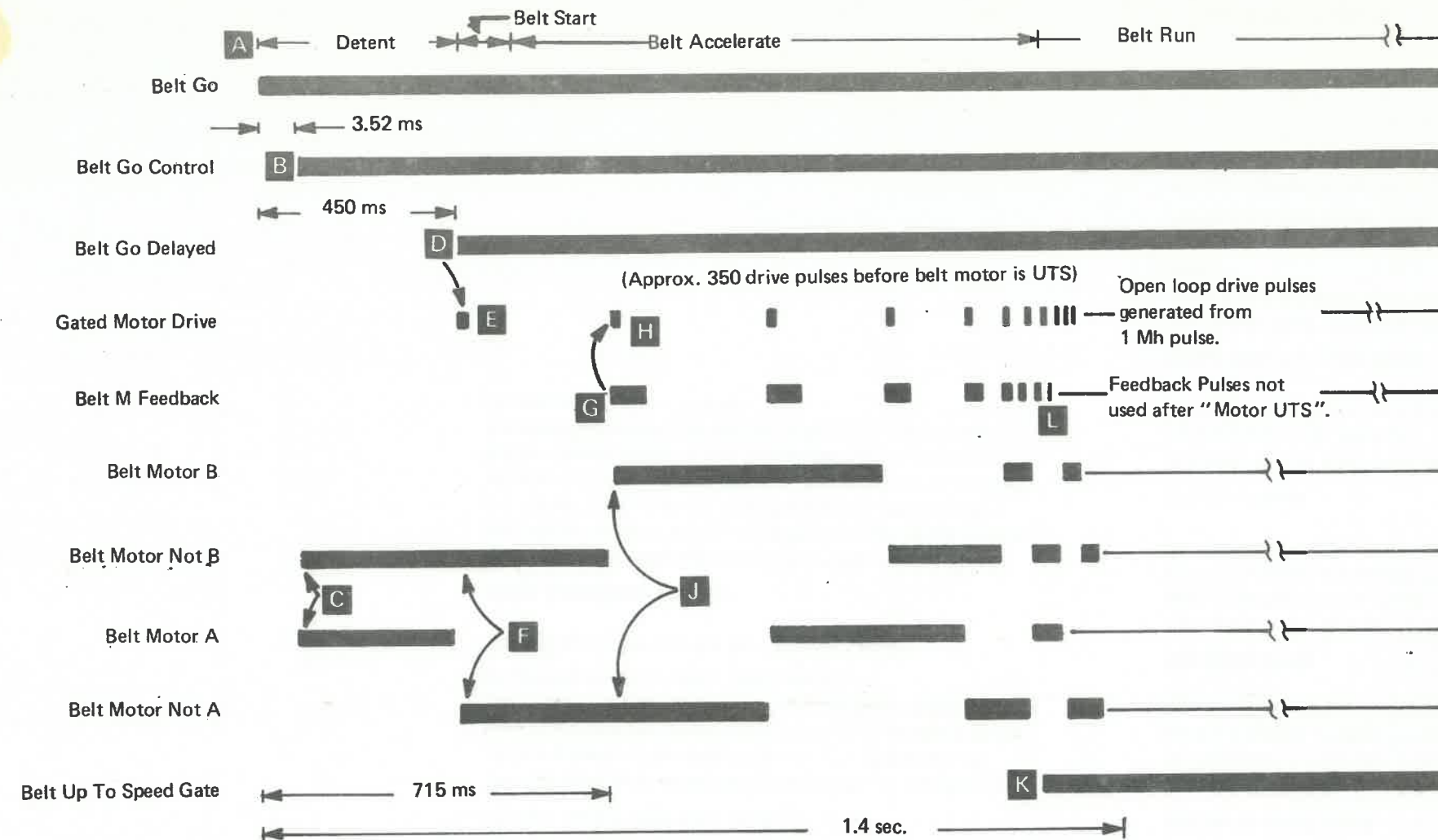
A total of three 'Printer Busy' signals during a print cycle drops 'Belt Go' and printer 'Ready'.

# PRINT BELT MOTOR CONTROL TIMING CHART

## PRINT BELT MOTOR CONTROL TIMING

Note: The conditions shown are from a Power On Reset status.

- 'Belt Go' **A** is sent by the system to start the printer.
- The Belt Go Control latch is turned on **B** from 1 to 4 ms after 'Belt Go'.
- 'Belt Go Control' causes 'not A' and 'not B' to be active **C** electrically detenting the stepper motor. (The motor must first detent in order to start on the first advance pulse.)
- The Belt Go Delayed latch **D** is turned on approximately 450 ms after 'Belt Go Control'.
- 'Belt Go Delayed' (until 'Belt Start Latch') gives 'Start Pulse' which allows 'Motor Drive' and 'Gated Motor Drive' **E** to the motor driver card. The first stepper motor advance pulse is 'A' and 'not B' **F**.
- As the motor starts to turn, the feedback LED senses the edge of the first hole on the feedback disk and sends back its first pulse **G**. This sets the 'Gated Motor Drive' latch **H**, which produces the next stepper motor advance pulse (B, A) **J**.
- The 'Belt M Feedback' pulse **G** increases in frequency as the stepper motor speed increases, setting the Feedback latch, which sets the MUTS latch before the 900 decode circuit can set the Slow latch. See "Print Belt Motor Feedback Control", 15-090.
- Approximately 715 ms to 1.4 seconds after 'Belt Go' is active, 'Belt Up To Speed' becomes active **K**. After 'Belt Up To Speed' is reached feedback pulses are no longer used **L**.

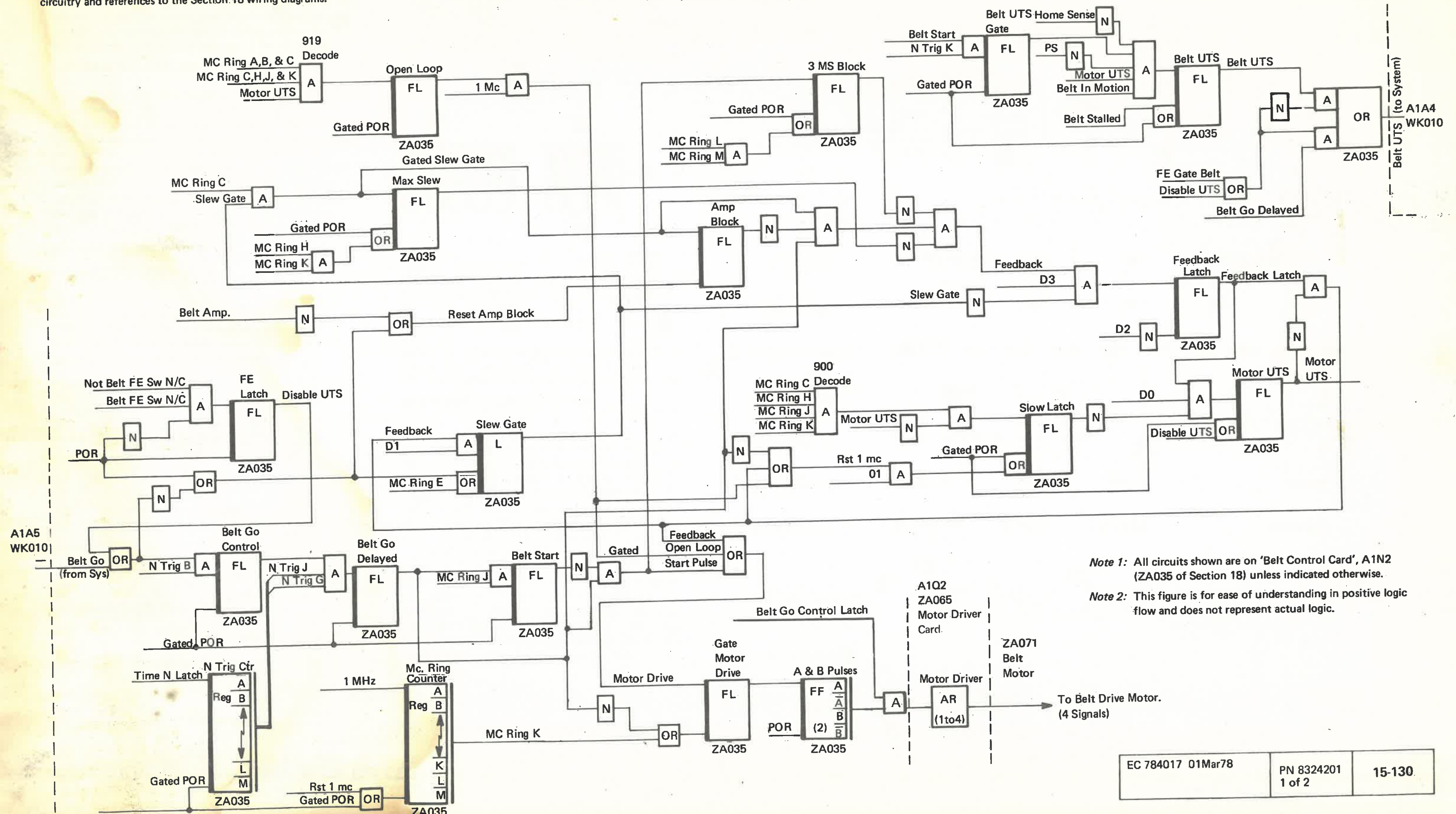




# PRINT BELT DRIVE MOTOR CONTROL LOGIC

Note: The 2nd level diagram shows the Print Belt Motor Control circuitry and references to the Section 18 wiring diagrams.

A1N2 (ZA035) Belt Control Card



PRINT SUBSCAN (PSS) AND HOME PULSES

Note: For all removals, adjustments and installations, see Section 4, 4-000.

PRINTER SUBSCAN COMPONENTS

Print Belt Timing Marks

The timing marks A are raised marks on the print belt used to generate PSS pulses. The example of one print belt shows 5 marks B for every two characters C.

Transducer

This permanent magnet and coil are used to sense timing marks or timing marks that are missing.

PSS Pulses

The raised timing marks are sensed by the transducer which sends pulses to the electronics gate to generate PSS and 'Home' pulses. (A missing timing mark D creates a 'Home' pulse.)

Synchronization to System

The Home and PSS pulses are used to synchronize the mechanical and the electrical portions of the printing operation. (The print belt is synchronized to the print belt image contained in the adapter.)

PSS EMITTER OPERATION

Print Belt and Belt Guide Roller

The print belt moves counterclockwise between the transducer E and a belt guide roller F. Tension from the idler pulley keeps the belt against the belt guide roller. The belt drives the roller by friction to prevent wear. The belt guide roller allows the belt to run smoothly, and also acts as a backstop for transducer adjustments. The transducer is adjusted close enough to the print belt timing mark to be able to sense the timing marks, but not wear the timing marks or the transducer G. See "Print Subscan Transducer-Service Check", Section 4, 4-000, for adjustments.

Transducer and Amplifier

The transducer is energized as each raised timing mark on the print belt passes the transducer. At print speed, the timing marks generate pulses through the transducer coil H to the amplifier J. The belt control card K looks at 'Early Emitter' to provide 'PSS' and 'Home' L pulses to the system at the correct time, once Belt UTS M has been reached. (See "Belt Up To Speed," Section 15-090.)

PSS AND HOME PULSES DEVELOPMENT AND USE

PSS Pulses

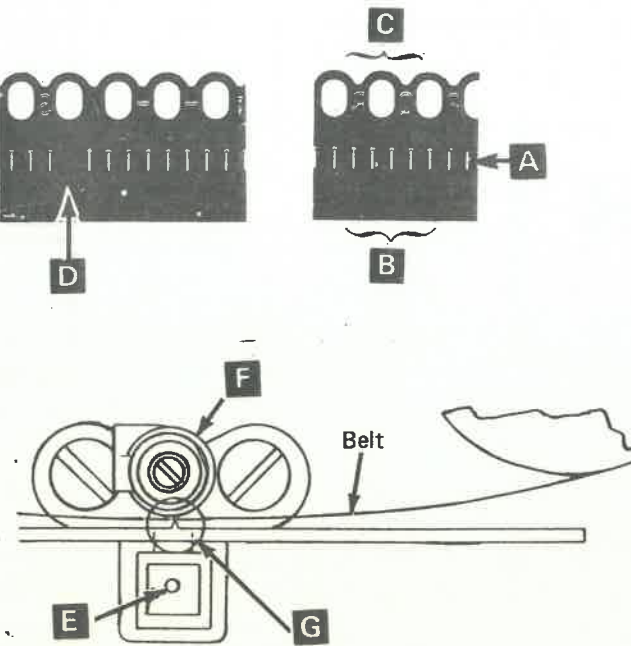
The print belt emitter output (a 1300 MV, peak-to-peak waveform) is sent to the amplifier card. A 'Time N' latch emits a pulse to synchronize the outputs of 'early', 'raw' and 'pure emitter' to obtain a PSS pulse and 'Home time'. The PSS pulses are sent continuously to the system. 'Home' pulse is sent only when there is a missing timing mark.

The print belt emitter output is amplified N and sent to the Belt Control Card as 'Early Emitter'. The line 'Early Emitter' sets an Early Emitter latch O, which in turn is used to set the Raw Emitter latch. As shown at P, the Raw Emitter latch is active later than 'Early Emitter' O to prevent extra input from the print belt emitter amplifier. (If random noise enters during the time shown at Q, it will not be passed on because of this difference of turn-on times of the latches.)

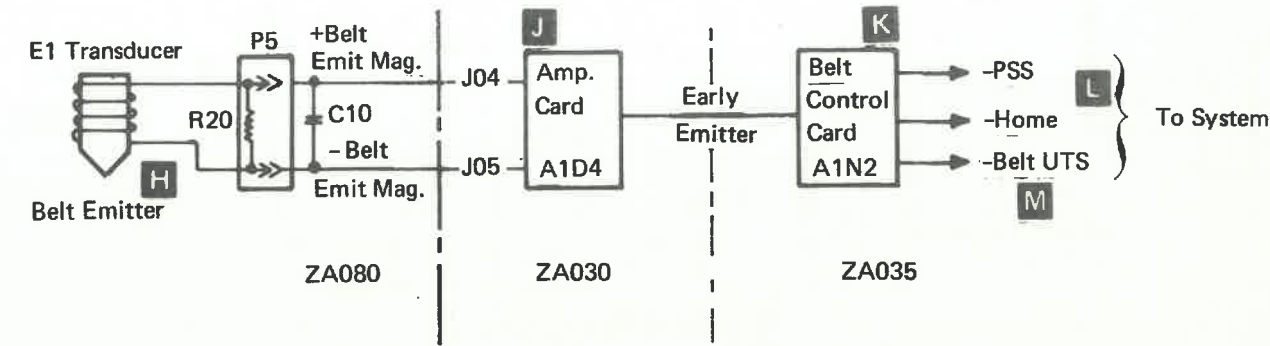
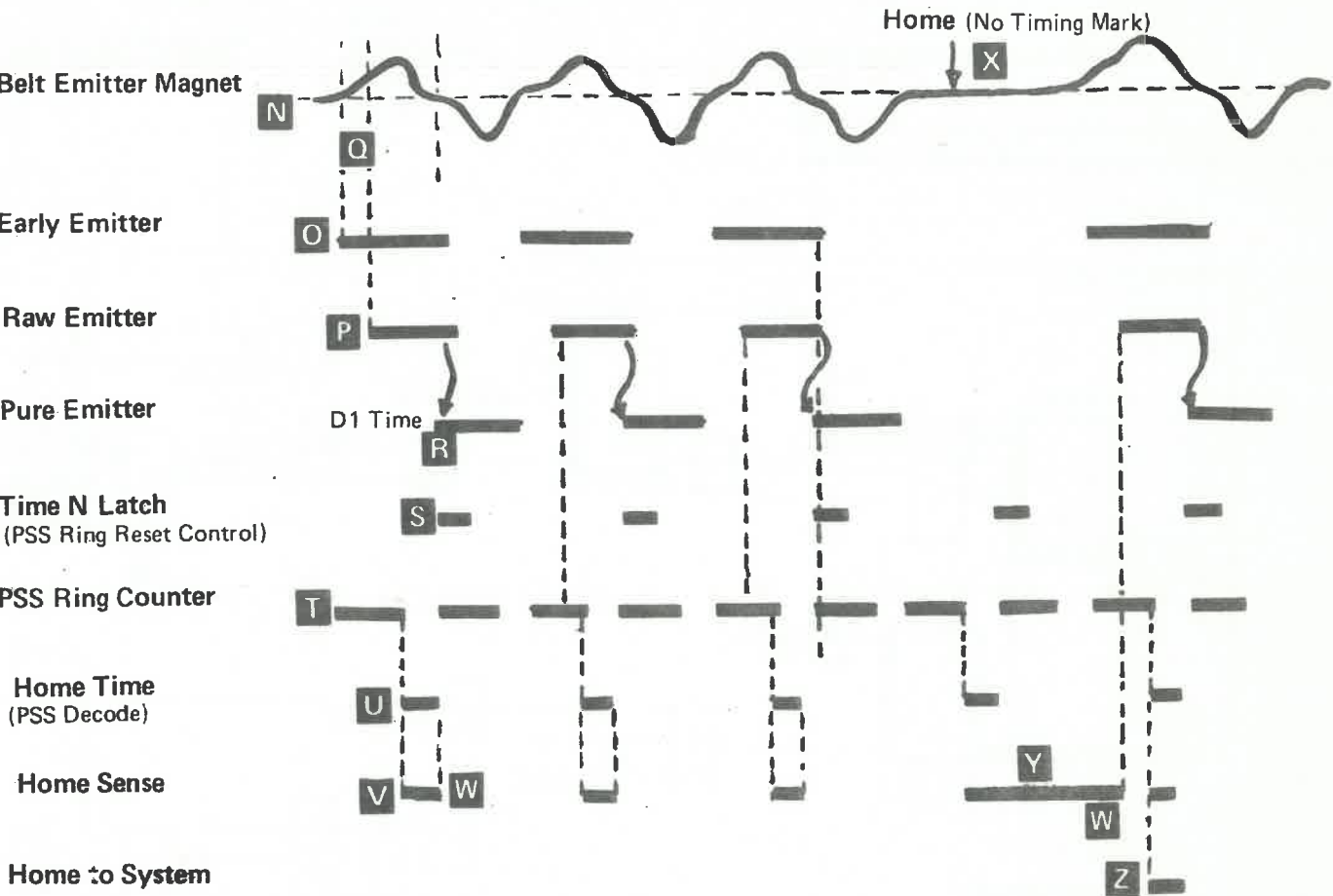
Home Pulse and Synchronization

Upon the fall of the Raw Emitter latch and the next 'D1' time, Pure Gate latch is set. This activates the Pure Emitter latch and synchronizes 'Pure Emitter' R to the electronics clock.

The Time N latch S and the PSS Ring Counter T are used for timing and control. 'Time N' occurs from D1 time to the following D0 time. Home time U is a decode of the PSS Ring. It turns on the Home Sense latch V, which resets when 'Raw Emitter' turns on W.



However, at 'Home Time' X, when a timing projection is not present, 'Early Emitter' and 'Raw Emitter' are not set. Because 'Raw Emitter' normally resets 'Home Sense' but is now absent, 'Home Sense' stays active Y. 'Home Sense' allows 'Home' to synchronize the system to the print belt Z.





PRINT UNIT AND HAMMERS

PRINTING COMPONENTS

Hammers

The 5211 Printer has 132 print positions with either 66 (model 1) or 132 (model 2) hammers.

Subscans

A subscan is the time required to option every tenth print position to every fourth print belt position (model 1); or every fifth print position to every other print belt position (model 2). Five subscans make one print scan. (This is a function of the CPU or the using system.)

Print Scans

On a model 1 a print scan is the time required to option one character to every odd print position or every even position. On model 2 the print scan is the time required to option one character to all print positions.

Print line

Each character of a print belt is optioned to print every print position. Therefore, a 48-character-set belt would have a print line of:  
48 odd and 48 even print scans for model 1  
48 total print scans for model 2

Universal Character Set Buffer (UCSB)

This is a buffer, in the system, which stores the image of the characters on the print belt. The buffer must be reloaded if the print belt is changed. (This is a function of the CPU or the Host System.)

Print line Buffer (PLB)

This buffer stores the image of the line to be printed. (This is a function of the CPU or the Host System).

Forms Thickness and Impression Control

This control mechanically adjusts the platen for throat clearance and changes an impression control potentiometer to vary the duration of the hammer-fire pulse. See "Impression Control Single Shot", 15-160.

Addressing

Hammer latches are addressed when the character on the print belt matches the character to be printed from the Print Line Buffer and the character is aligned with the correct print position. The latches are turned on by an 8-byte (plus parity) addressing scheme from the system.

Firing the Hammers

Hammers are fired if their hammer latches have been set approximately 1½ subscans prior to the print time. ('Fire Tier' lines control the 'hammer on' time.)

Error Checking

Print operation monitored by 'Data Parity Check', 'Hammer Echo Check', and 'Any Hammer On Check'

PRINT UNIT CASTING

Platen

The platen on the 5211 printer is adjustable to allow for multipart forms. The forms thickness control **A** is set from 1 through 6, depending on the total forms thickness. The bar extending to the left **B** operates a cam and roller assembly which moves the platen closer to, or farther away from the hammers.

Forms Thickness Control

The movement of the forms thickness control also adjusts the Impression Control Potentiometer by sliding a pin in the slot at **C**. This turns the arm attached to the potentiometer **D**, thereby changing the value from the potentiometer. This potentiometer determines the pulse width from the Impression Control Single Shot. See "Impression Control Single Shot", 15-160.

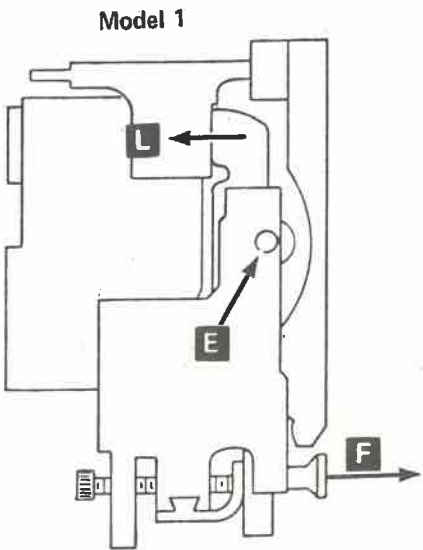
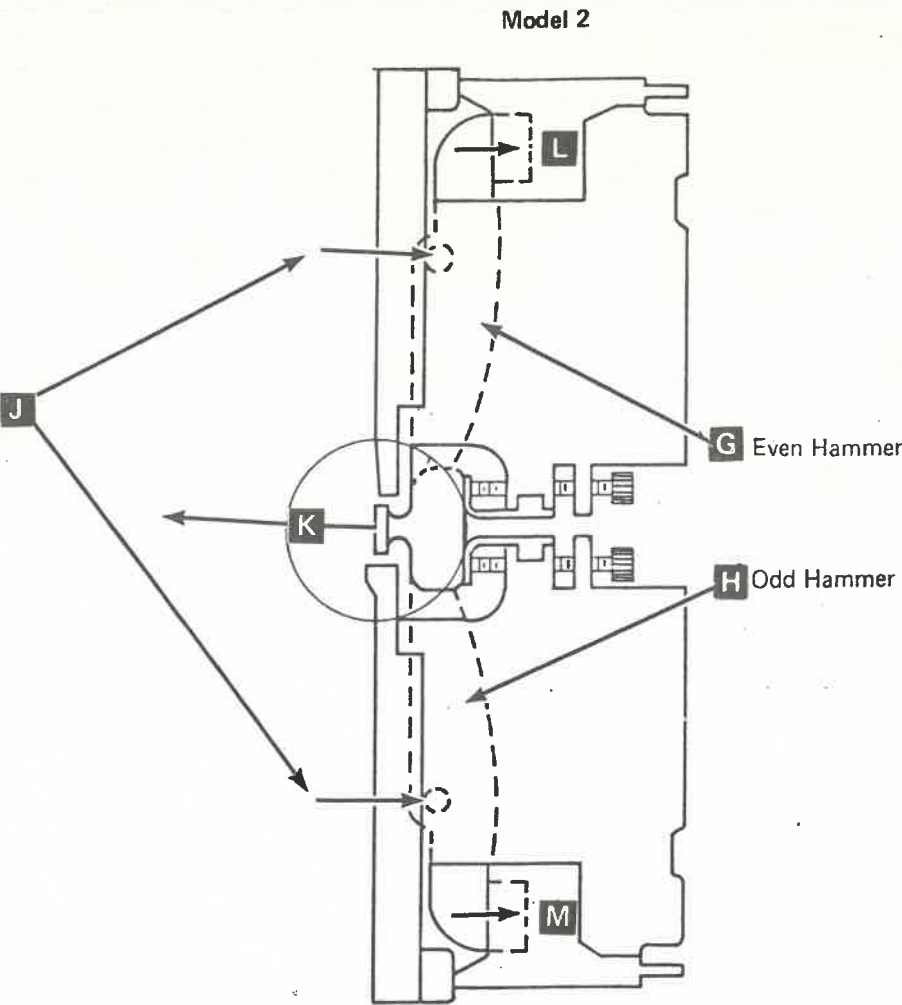
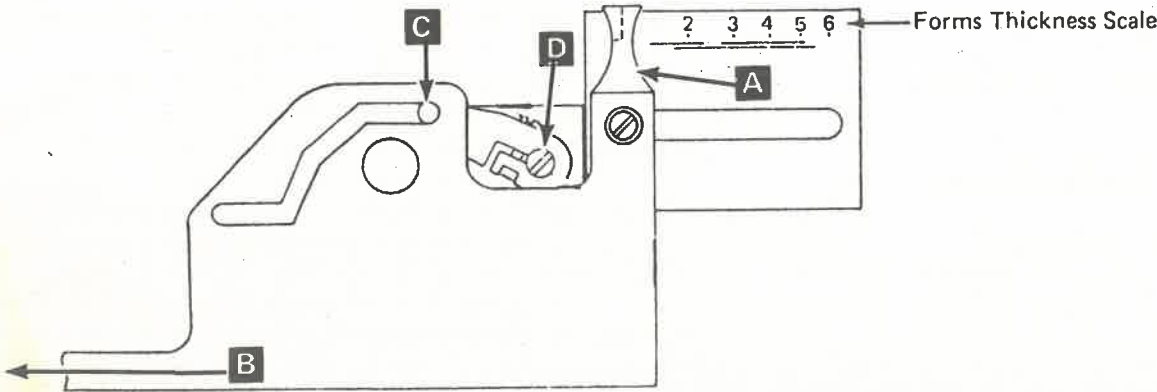
HAMMER UNIT

Hammers

Model 1 - The hammer, pivoting at **E** is forced toward the platen, as shown by the arrow **F**.  
Model 2 - The even (top) **G** and the odd (bottom) **H** hammers pivot at the points shown by the arrows **J** and **K**. The hammers move toward the platen as shown.

Hammer Coils

The coils on both Model 1 and Model 2 are such that the winding goes around the axis of the coil and the tail of the hammer. It is attracted into the center of the coil as shown at **L** and **M**.



# THEORY OF PRINTING

## Print Mechanism

The print belt is an endless steel band that is 1219.2 mm (48.0 in) long, and has 192 raised characters (for Models 1 and 2). While the belt is continuously moving, printing can only occur when a known character is aligned with the correct hammer position. The timing or alignment of the correct character with a print position is synchronized by the printer sending the 'Home' and 'PSS' pulses to the system, which controls the print time.

## Home Pulse

The Home Pulse is generated 1½ subscans before hammer number one can be fired to print the first character in print position number one. Therefore, optioning a hammer to print occurs 1½ subscans before the printing occurs. If the missing timing mark (home) is lined up with the print belt emitter, numerical character 1 is slightly to the right of print position one. By the time the hammer is fired, character 1 and print position one are both electronically and mechanically aligned when the character is to be printed.

## Print Subscans

The print subscan pulses electronically divide the print belt character spacing into 5 parts, called fire tiers or subscans **A**. The subscans are generated by the printer during each complete print scan period. A print scan is the time interval between the alignment of a sequence of belt characters at print position one. During one print scan, all print positions will have been optioned to one character.

## Impression Control Single Shot

The forms thickness control mechanically adjusts the print mechanism forward or back for different form thicknesses. The control also adjusts a potentiometer that varies the width of the image control single shot pulse. As the print mechanism is adjusted for thicker forms, the pulse width is also increased. **B** The pulse width can vary from 251 ms, for single part form, to 523 ms for 6 part forms. The width of the single-shot pulse determines the width of the fire tier pulses. **C** The variable times are shown in shaded areas.

# PRINTING

## Printing Sequence - Model 1

The relationship of hammer pitch to print belt pitch results in a printing sequence such that at any one subscan every tenth print position and every fourth type element are aligned. Starting with print position one, this electronic sequence continues until all the hammers to be selected during each subscan have had the option of firing. Because the Model 1 print hammers each span two print positions, the odd positions **D** are scanned during the passage of one array of characters and the even positions **E** are optioned

during passage of the second array. Two sets of characters must pass the print line to ensure printing of a full line. A delay of 15 subscans (10.35 ms nominal) must be allowed for hammer settling **F** before the even positions can be optioned for firing during the passage of the second array

The following is an example of the sequence of character/print options occurring in the odd scan or 5 subscans.

Subscan 1 - Print Positions 1, 11, 21, 31, etc., optioned respectively to characters 1, 5, 9, 13, etc.

Subscan 2 - Print Positions 3, 13, 23, 33, etc., optioned respectively to characters 2, 6, 10, 14, etc.

Subscan 3 - Print Positions 5, 15, 25, 35, etc., optioned respectively to characters 3, 7, 11, 15, etc.

Subscan 4 - Print Positions 7, 17, 27, 37, etc., optioned respectively to characters 4, 8, 12, 16, etc.

Subscan 5 - Print Positions 9, 19, 29, 39, etc., optioned respectively to characters 5, 9, 13, 17, etc.

During one odd print scan, all odd print positions have been given an option at one character of a given set. The maximum number of scans required to print all odd characters equals the character set size.

## Printing Sequence - Model 2

The relationship of the distance between hammers to the distance between each character on the belt results in a printing sequence such that in any one subscan every fifth print position and every second type element are aligned. Starting with position one, this sequence continues until all the hammers to be selected during each subscan have had the option of firing. One full character set must pass print position one to ensure that all positions have been optioned to print.

The following is an example of the sequence of character/print options occurring in one scan or 5 subscans.

Subscan 1 - Print Positions 1, 6, 11, 16, etc., optioned respectively to characters 1, 3, 5, 7, etc.

Subscan 2 - Print Positions 3, 8, 13, 18, etc., optioned respectively to characters 2, 4, 6, 8, etc.

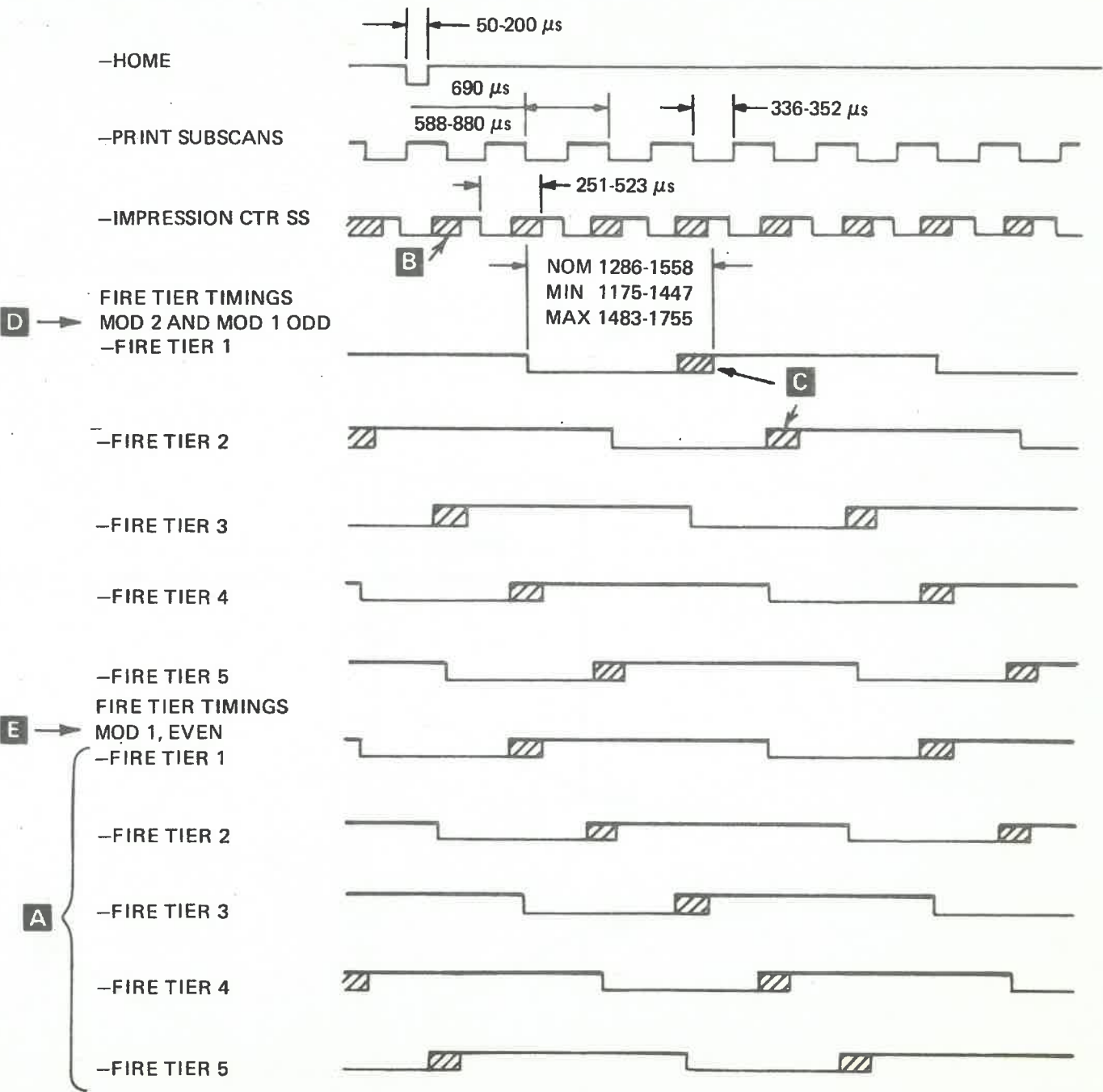
Subscan 3 - Print Positions 5, 10, 15, 20, etc., optioned respectively to characters 3, 5, 7, 9, etc.

Subscan 4 - Print Positions 2, 7, 12, 17, etc., optioned respectively to characters 4, 5, 8, 10, etc.

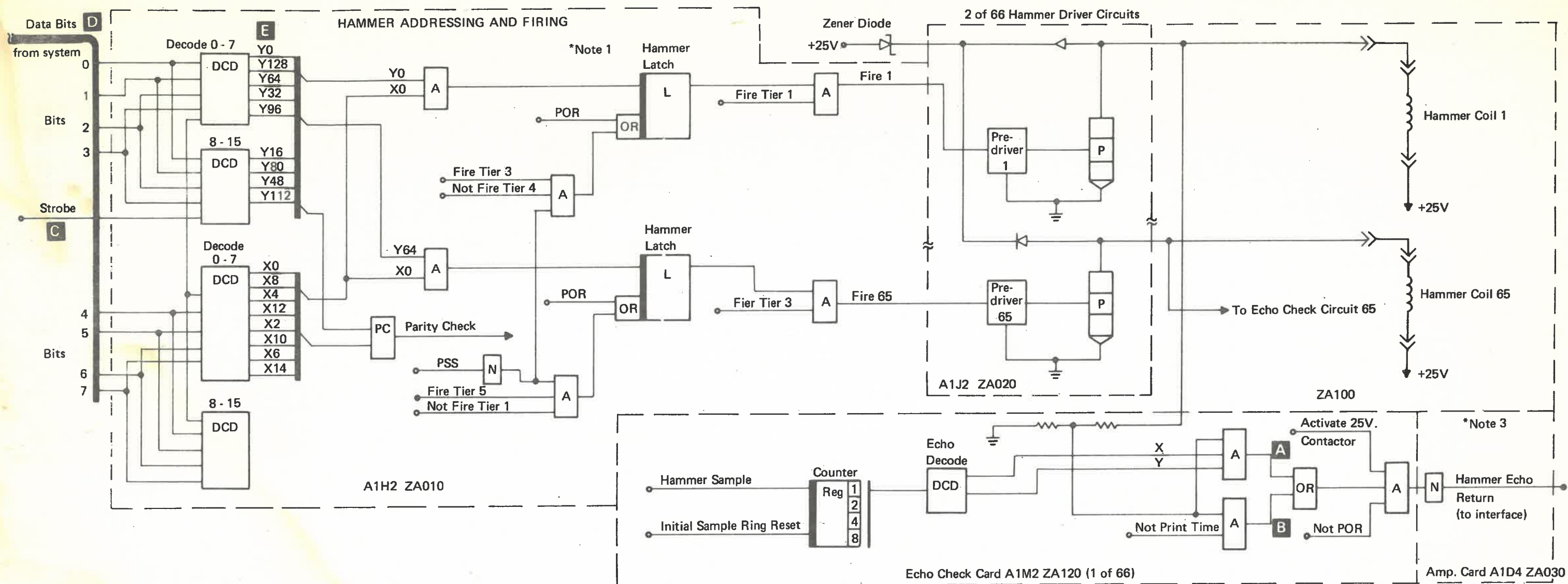
Subscan 5 - Print Positions 4, 9, 14, 19, etc., optioned respectively to characters 5, 7, 9, 11, etc.

The maximum number of scans required to print all characters equals the character set size.

PRINT TIMING — MODEL 1, 2 (ON MODEL 1 ALLOW 15 SUBSCANS FOR HAMMER SETTING **F** BETWEEN ODD AND EVEN SCANS 10.35 ms NOMINAL)







**Note 1:** This figure is for ease of understanding the Model 1, in positive logic. It does not represent actual logic.

**Note 2:** This chart represents the actual hammer decode lines.

**Note 3:** **A** Any Hammer On Check - an output when not print time.

**B** Hammer Echo Check - any incorrect output during print time.

#### Data Strobe

'STROBE' **C** is supplied by the using system and is used by the printer to validate the data bus transmitted by the host system. Data must be made active on the bus 0.6 microseconds minimum before strobe is made active. Data must remain active for 0.6 microseconds minimum after strobe is made inactive.

#### Hammer Fire Timing

The 5211 Printer Hammer Fire sequence uses a strobed 8 bit **D** interface plus a parity bit from the using system to determine which hammers are to be fired in each subscan or tier. The 8 bit interface is a transmission of the actual print position to be fired.

The 'Print Position' must be sent by the using system within 1.5 subscans prior to actual firing. The printer senses which hammer latches are to be turned on by decoding the Data Bits. **E** The system then provides 5 'Fire Tier' lines which determine the actual On time (including the impression control SS line - see 15-160) for each of the 5 Tiers. Any hammer whose latch was set on previously in that subscan, will be fired during this Fire Tier Time. The hammer Latch will be turned off by the printer within 3.5 subscans after it was turned on. Because the fire tier lines are used to generate resets to the hammer latches, the fire tier signal lines are active whenever the belt is running and not active when the belt is not running.

Model 1 \*Note 2

	Y0	Y16	Y32	Y48	Y64	Y80	Y96	Y112	Y128
X0	1	17	33	49	65	81	97	113	129
	2	18	34	50	66	82	98	114	130
X2	3	19	35	51	67	83	99	115	131
	4	20	36	52	68	84	100	116	132
X4	5	21	37	53	69	85	101	117	
	6	22	38	54	70	86	102	118	
X6	7	23	39	55	71	87	103	119	
	8	24	40	56	72	88	104	120	
X8	9	25	41	57	73	89	105	121	
	10	26	42	58	74	90	106	122	
X10	11	27	43	59	75	91	107	123	
	12	28	44	60	76	92	108	124	
X12	13	29	45	61	77	93	109	125	
	14	30	46	62	78	94	110	126	
X14	15	31	47	63	79	95	111	127	
	16	32	48	64	80	96	112	128	

MODEL 1 - TYPE SELECTION

Subscan, Print Belt, and Print Position Relationship (Model 1)

- 1. Line 1 represents a portion of the hammer mechanism (hammers 1-10).
- 2. Line 2 represents print positions 1-20 printed by hammers 1-10.
- 3. Line 3 represents timing marks on the print belt. The solid marks are etched marks on the belt and the dotted marks are the electronically inserted pulses produced by the printer circuit. The first timing mark shown is an etched mark followed by three dotted marks. The center dotted mark is equivalent to the home pulse (absence of a timing mark pulse). This dotted mark is also subscan five, followed by subscan one, two, etc.
- 4. Line 4 represents the print belt and the relationship of the characters to the print positions in line two above.
- 5. The remaining lines indicate print belt sequence and the position of the characters in the scanning process.

The five subscans represent either odd or even print positions. To match a character to a subscan, align the character with one of the print positions: When it aligns with a print position, the column on the left (SS1 to SS5) shows on which subscan the character is printed. The character is optioned to print on the previous subscan. Even print positions are optioned and printed on even scans; odd positions are optioned and printed on odd scans.

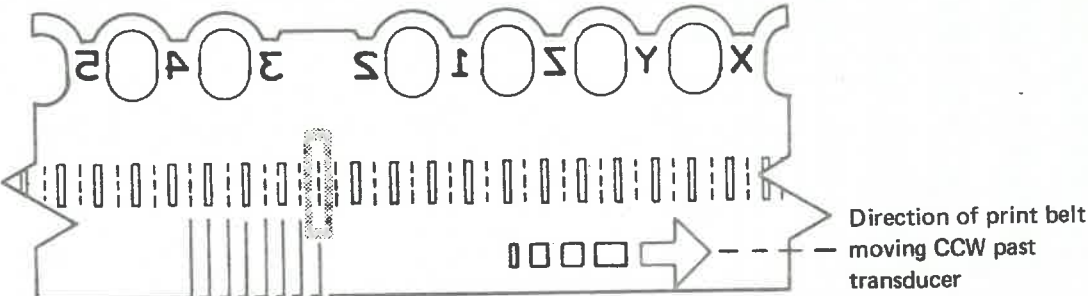
Examples:

- 1. Character 2 in line 6 is printed in SS3 but optioned in SS2 (odd print position, odd scan).
- 2. Character 6 in line 8 is printed in SS5 but optioned in SS4 (even print position, even scan).

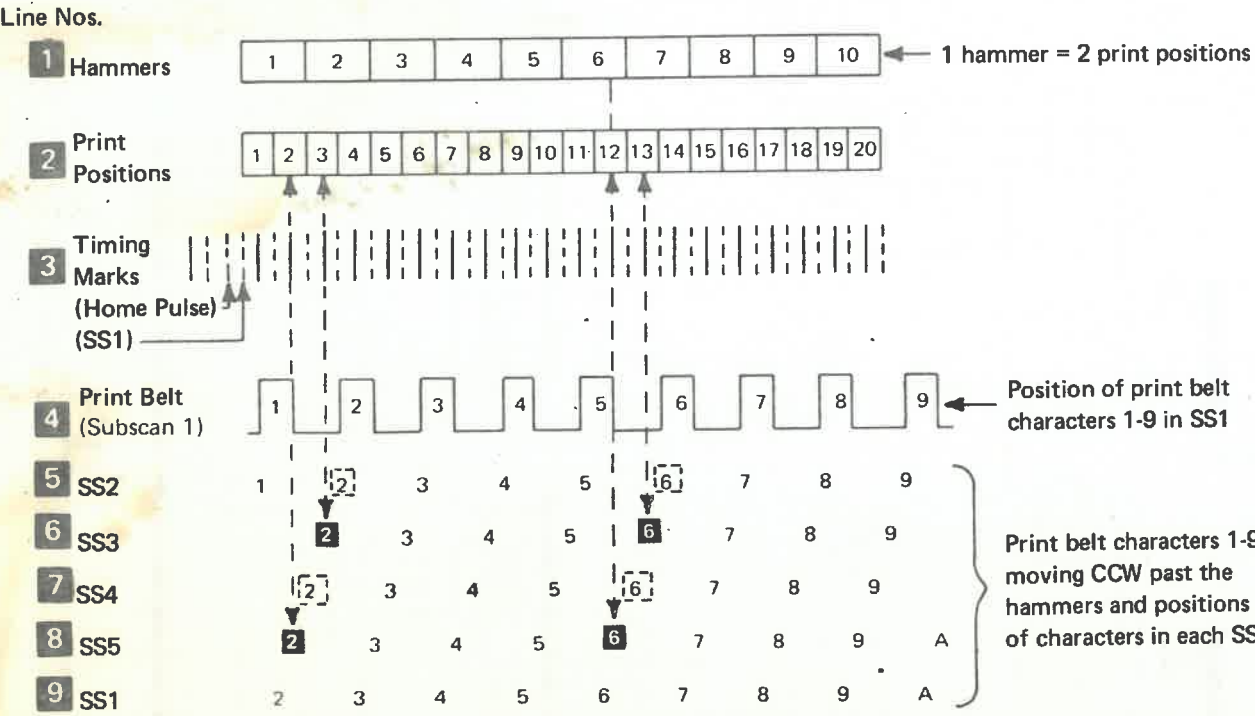
Note that every tenth position is aligned to print; for example: 1, 11, 21 etc., 2, 12, 22 etc.

Scanning Sequence (Model 1)

The figure shows the print belt passing the transducer and the sequence of scanning, starting after home pulse. Each set of scans is repeated until all characters on the print belt have been optioned to print in each print position. For a 48 character-set print belt, there are 96 print scans: 48 even and 48 odd, plus three between odd and even scans, for hammer settling:



- Odd Subscans**  
Home Pulse position (used also as subscan 5)  
SS1—Option PP 1 with 1  
SS2—Fire PP 1, option PP 3 with char. 2  
SS3—Fire PP 3, option PP 5 with char. 3  
SS4—Fire PP 5, option PP 7 with char. 4  
SS5—Fire PP 7, option PP 9 with char. 5  
SS1—Fire PP 9, option PP 1 with char. 2  
SS2—Fire PP 11, option PP 3 with char. 3
- Even Subscans**  
SS1—Option PP 6 with char. 3  
SS2—Fire PP 6, option PP 8 with char. 4  
SS3—Fire PP 8, option PP 10 with char. 5  
SS4—Fire PP 10, option PP 2 with char. 2  
SS5—Fire PP 2, option PP 4 with char. 3  
SS1—Fire PP 4, option PP 6 with char. 4





MODEL 2 - TYPE SELECTION

Subscan, Print Belt, and Print Position Relationship (Model 2)

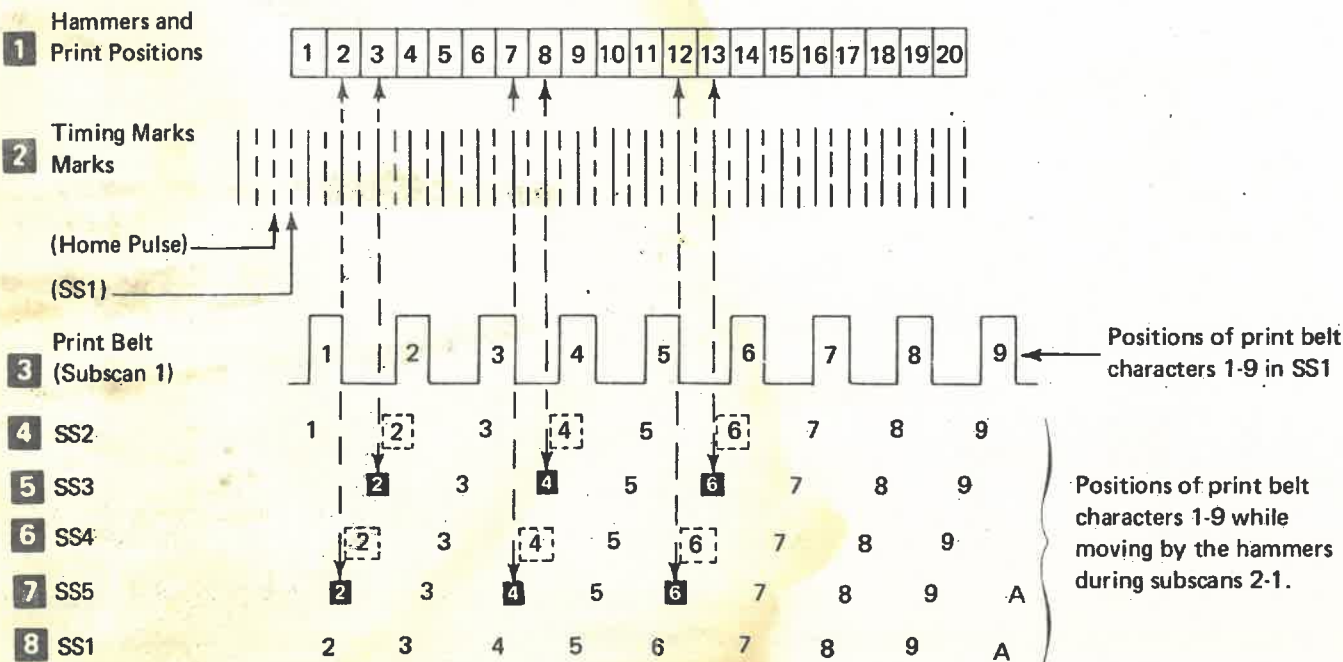
- 1. Line 1 represents print positions 1-20 printed by hammers 1-20.
- 2. Line 2 represents timing marks on the print belt. The solid marks are timing marks on the belt and the dotted marks are the electronically inserted pulses produced by the printer circuits. The first timing mark shown is followed by the three dotted marks. The center dotted line is the same as to the home pulse (absence of a timing mark pulse). This dotted mark is also subscan five, followed by subscan one, two, etc. (SS1, SS2).
- 3. Line 3 represents the print belt and the relationship of the characters to the print positions in line 2 above.
- 4. The remaining lines indicate print belt sequence and the position of the characters in the scanning process.  
To match a character to a subscan, align the character with one of the print positions above. When it aligns with a print position, the column on the left (SS1 to SS5) shows on which subscan the character is printed. The character was optioned to print on the previous subscan.

Examples:

- 1. Character 2 in line 5 is printed in SS3, but was optioned in SS2.
- 2. Character 6 in line 7 is printed in SS5, but was optioned in SS4.

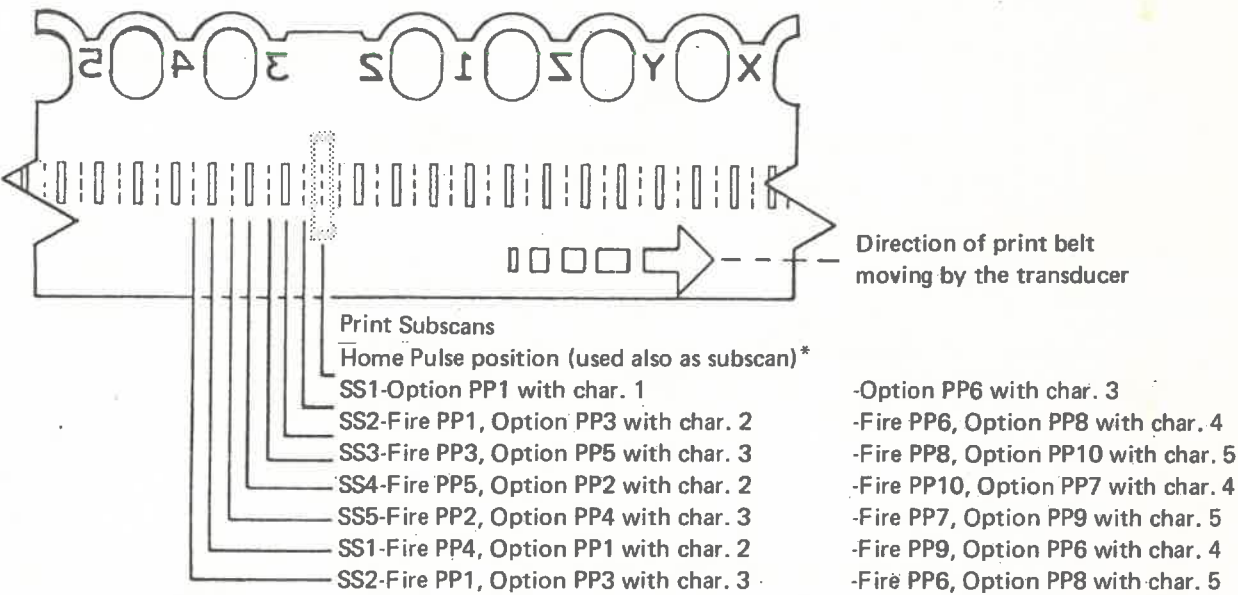
Note that every fifth position is aligned to print; for example:  
1, 6, 11, 16, 21, 26, etc.,  
2, 7, 12, 17, 22, 27, etc.

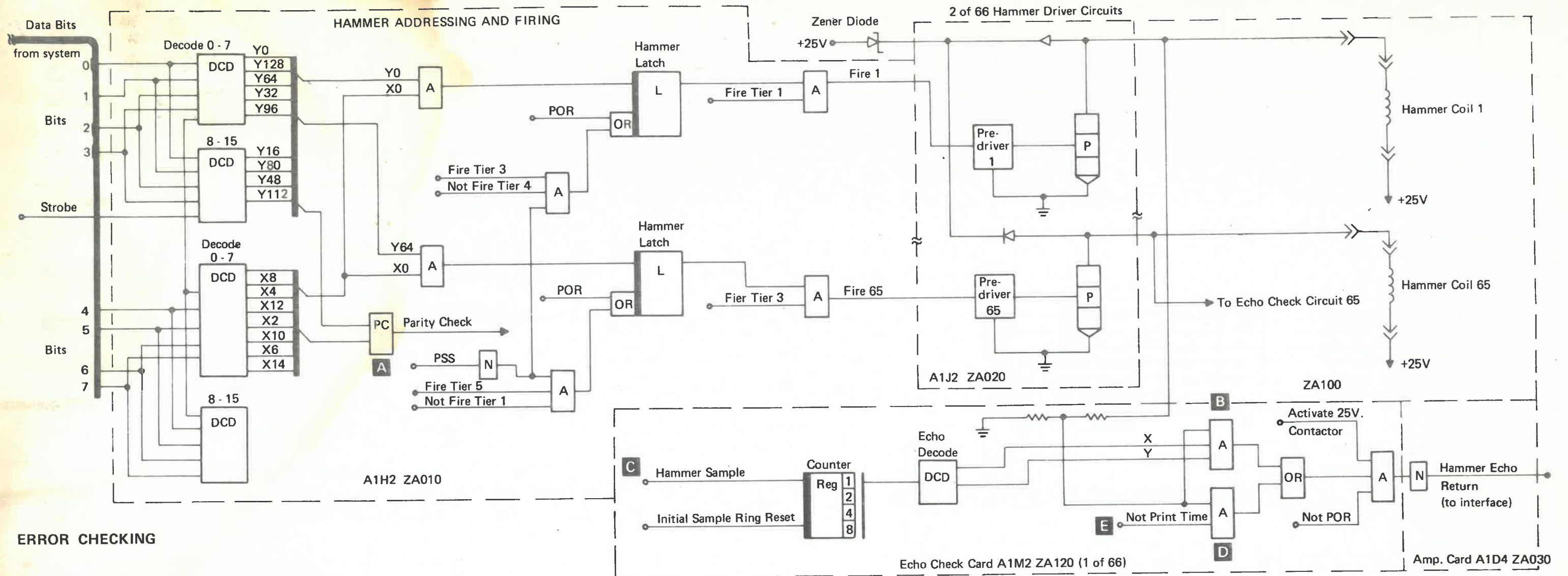
Line Numbers



Scanning Sequence (Model 2)

The figure shows the print belt passing the transducer and the sequence of scanning starting after home pulse. Each set of scans is repeated until all characters on the print belt have been optioned to print in each print position. For a 48-character-set print belt, there are 96 print scans. 48 even and 48 odd, plus 3 between odd and even scans for hammer settling.





## ERROR CHECKING

### Data Parity Check

The printer provides odd parity checking of the hammer position data bits. When an even parity condition is decoded **A** out of the parity check circuit, a latch is turned on when data strobe is active. The data parity check is valid on the interface 500 nanoseconds after strobe becomes active. The check indicator must be turned on when the data parity error is sensed.

### Hammer-On Echo Check **B**

The Printer Hammer Control Logic includes built-in Serial Hammer Echo Check circuitry whereby the using system checks the status of every hammer to determine its on or off state. During print time, the system transmits a burst of 133 pulses on one interface line (Hammer Sample). **C** The Hammer Sample pulses are transmitted no earlier than 10  $\mu$ s after the start of the leading edge of PSS, or no earlier than 20  $\mu$ s after the Impression Control Single Shot goes inactive, whichever comes later. This allows the echo counter in the printer to be reset at PSS time. Checking must be complete by the next leading edge of the PSS pulse or the trailing edge of the single

shot, whichever comes earlier. This string of pulses is decoded serially by the printer logic. The first pulse is not used for hammer interrogation, therefore, it will not be returned on the Hammer Echo return line.

On a Model 2 printer, a pulse is returned for each hammer position fired, starting with the second sample pulse which addresses hammer position 1, through the 133rd pulse, which addresses position 132. Because there are only 66 hammers in the Model 1, the second sample pulse addresses print positions 1 and 2. The 132nd sample pulse addresses print positions 131 and 132. There is no response on the echo return to the odd sample pulses, i.e.; 1,3,5... 131,133. The odd pulses do not address any hammer positions in the Model 1 printer.

### Hammer-Off Checking—Not Print Time **D**

The circuits utilized for the Hammer-On Echo are also utilized for any Hammer-On check when the printer is not printing. The printer provides Not Print Time line **E** by monitoring the data transmission from the using system to the printer. While this line is active, the fact that any hammer coil is On is transmitted back to the using system on the Hammer Echo line, allowing them to open the 25V contactor. The 'Not Print Time' signal goes inactive at the time the first strobe signal is setting a hammer latch. If strobe is not active for a period of five print subscan pulses, the Not Print Time signal becomes active.

Model 1 \*Note 2

	Y0	Y16	Y32	Y48	Y64	Y80	Y96	Y112	Y128
X0	1	17	33	49	65	81	97	113	129
	2	18	34	50	66	82	98	114	130
X2	3	19	35	51	67	83	99	115	131
	4	20	36	52	68	84	100	116	132
X4	5	21	37	53	69	85	101	117	
	6	22	38	54	70	86	102	118	
X6	7	23	39	55	71	87	103	119	
	8	24	40	56	72	88	104	120	
X8	9	25	41	57	73	89	105	121	
	10	26	42	58	74	90	106	122	
X10	11	27	43	59	75	91	107	123	
	12	28	44	60	76	92	108	124	
X12	13	29	45	61	77	93	109	125	
	14	30	46	62	78	94	110	126	
X14	15	31	47	63	79	95	111	127	
	16	32	48	64	80	96	112	128	

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15-200



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RIBBON

INTRODUCTION

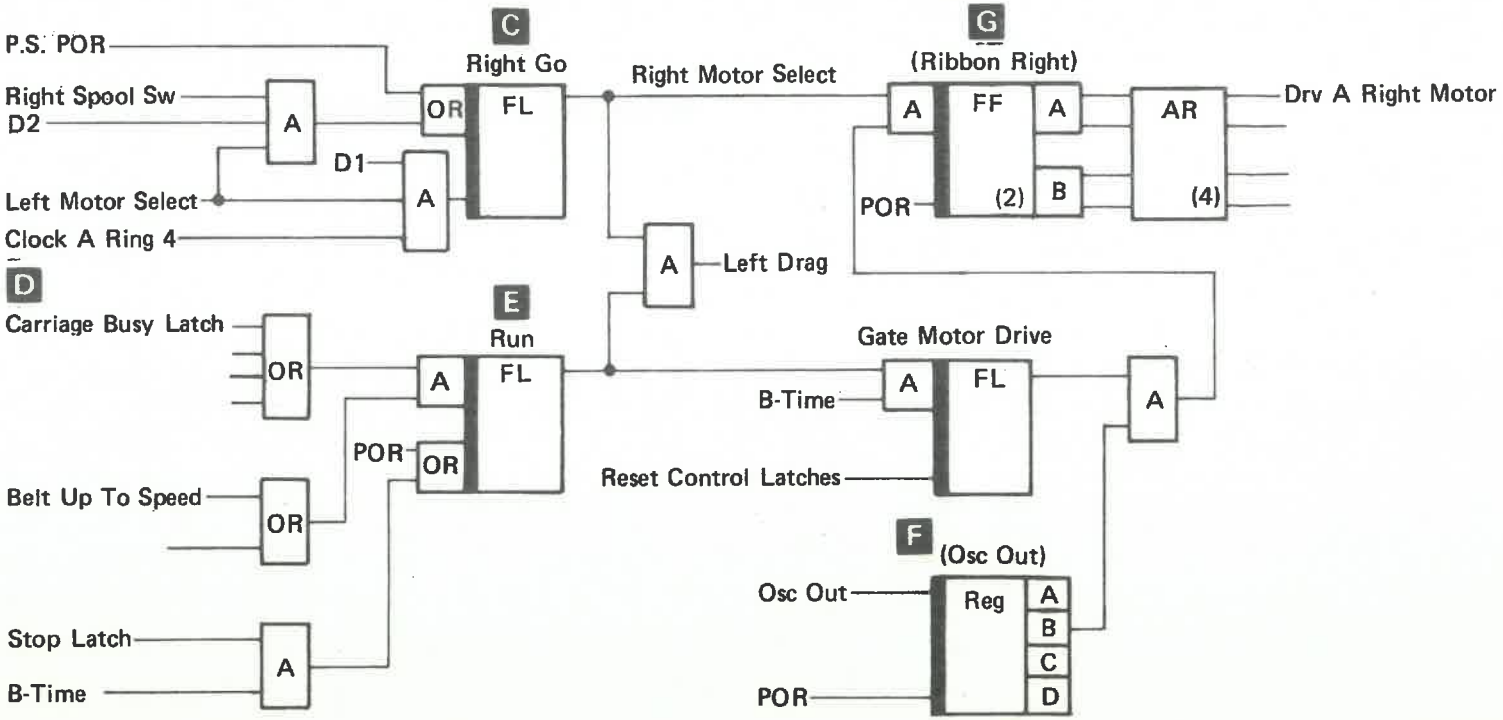
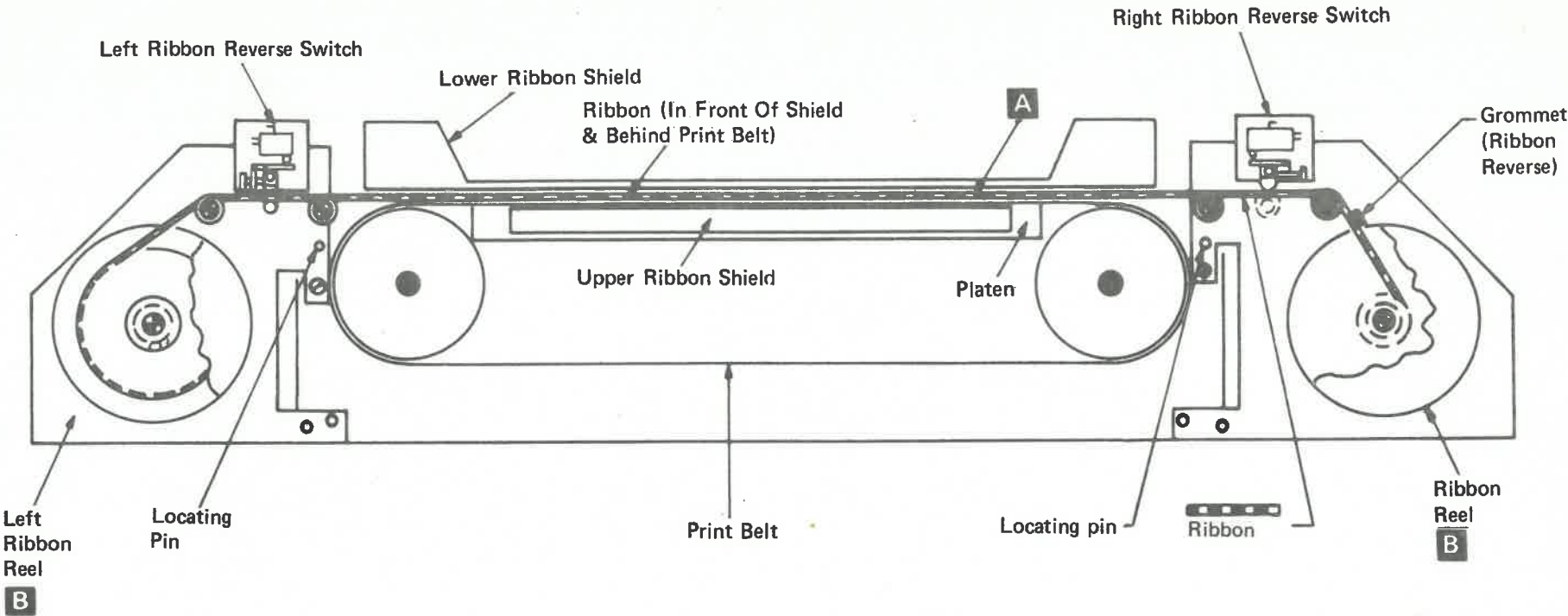
The ribbon is mounted in the printer so that it goes between the print belt and the forms **A** . Mounted under each ribbon reel **B** is a stepper motor that drives the ribbon either left or right. A drag signal is applied to the motor that is not being driven to keep tension on the ribbon. Ribbon motion always starts before a printing cycle and stops soon after printing is completed. Automatic ribbon reversal is accomplished whenever a ribbon reel is nearly empty.

RIBBON DRIVE

The Right Go latch **C** is always activated after a 'P. S. POR' is applied. This latch selects the right motor drive circuit. There is no ribbon movement, however, until a 'Carriage Busy Latch' signal **D** is received. This signal is active following a 'Carriage Go' from the system and remains active until after the carriage has stopped. 'Carriage Busy Latch' sets the Run latch **E** if the belt is up to speed. The outputs from the Run latch and the Right Go latch are ANDed to develop the 'Left Drag' signal. When the Run latch is active, Gate Motor Drive latch is activated with 'B-Time'.

The frequency and duration of the drive pulses to the ribbon motor are determined by the signal coming from the Osc Out register **F** . The input to this register is developed within the ribbon circuit. The decode of the speed register (15-240), establishes the time on the 'Osc Out' line so the drive pulses to the drive motor occur every 6.144 milliseconds or 167 times per second. The decode can also be set by activating the 'Low Speed Select' line (15-240), to change the motor drive to 122 steps per second.

These pulses are used to establish the condition of the A and B outputs from the two flip flops that make up Ribbon Right **G** . The four outputs from these flip flops are fed through drivers and are sent to the right drive motor. The pulses continue to be developed and the ribbon continues to run as long as the Run latch remains active and POR has not been recieved.





## RIBBON STOP

The output from the Gate Motor Drive latch activates the Start Time Out latch **A** with 'C-Time', 22 milliseconds after Gate Motor Drive latch is activated (with 'B-Time'). Allow Check latch **B** is then activated and also a signal is sent to the input circuit of the Allow Stop 1 latch **C**.

Allow Stop 1 latch is activated at 'D1' time, provided 'Set Run Latch' line is not active. Typically this would be as soon as 'Carriage Busy Latch' becomes inactive. With Allow Stop 1 latch active and Allow Stop 2 latch not active, the BC Time Counter **D** is reset to 'B-Time' inactive, which in turn resets 'C-Time' to inactive.

At D3 time 'Allow Stop 2' is activated and sends a signal to the input circuit of Stop latch. Because Allow Check latch is active, Stop latch becomes active when 'C-Time' becomes active again. The 'Stop Latch' line is combined with 'B-Time' to reset the Run latch and deactivate the 'Run Latch' line **E**. When the 'Run Latch' line is not active all ribbon motion stops and the control latches are reset with the reset line **F**.

## RIBBON REVERSAL

When the left ribbon reel is nearly empty a grommet on the ribbon pushes against and closes the left ribbon reverse switch and activates the 'Left Spool Sw' line **G**.

'Right Motor Select' **H** is still active when the 'Left Spool Sw' signal becomes active, so Left Go latch energizes at D0 time developing the 'Left Motor Select' line **J**.

At this time both the 'Right Motor Select' and 'Left Motor Select' lines are active so steps are taken to temporarily stop the ribbon and stop incoming print data during this reversal time.

When both select lines are active, the 'Reset Control Latches' line **F** and the Busy latch **K** are activated. The 'Reset Control Latches' line resets the timing (N-Time Counter) **L** and resets the Gate Motor Drive latch which prevents pulses from the 'Osc Out Latch' line **M** from being sent to drive the ribbon motors.

When Busy latch **K** is active, a 'Printer Busy' signal is sent to the system preventing any print information from being sent to the printer.

After the 'Left Motor Select' line becomes active, it is gated through an AND at a portion of 'D1' time (as a result of 'Clock A Ring 4') and deactivates the Right Go latch **N**.

When the N-Time Counter reaches '20 Time' (about 11 milliseconds), 'B-Time' is activated and the Gate Motor Drive latch becomes active again.

Left drive pulses are now developed the same as described in "Ribbon-Drive" (15-220) and the direction of the ribbon is reversed.

The Busy latch **K** is deactivated with 'C-Time' about 22 milliseconds after 'B-Time' is active, thus signalling the system that the printer is ready to receive print data again.

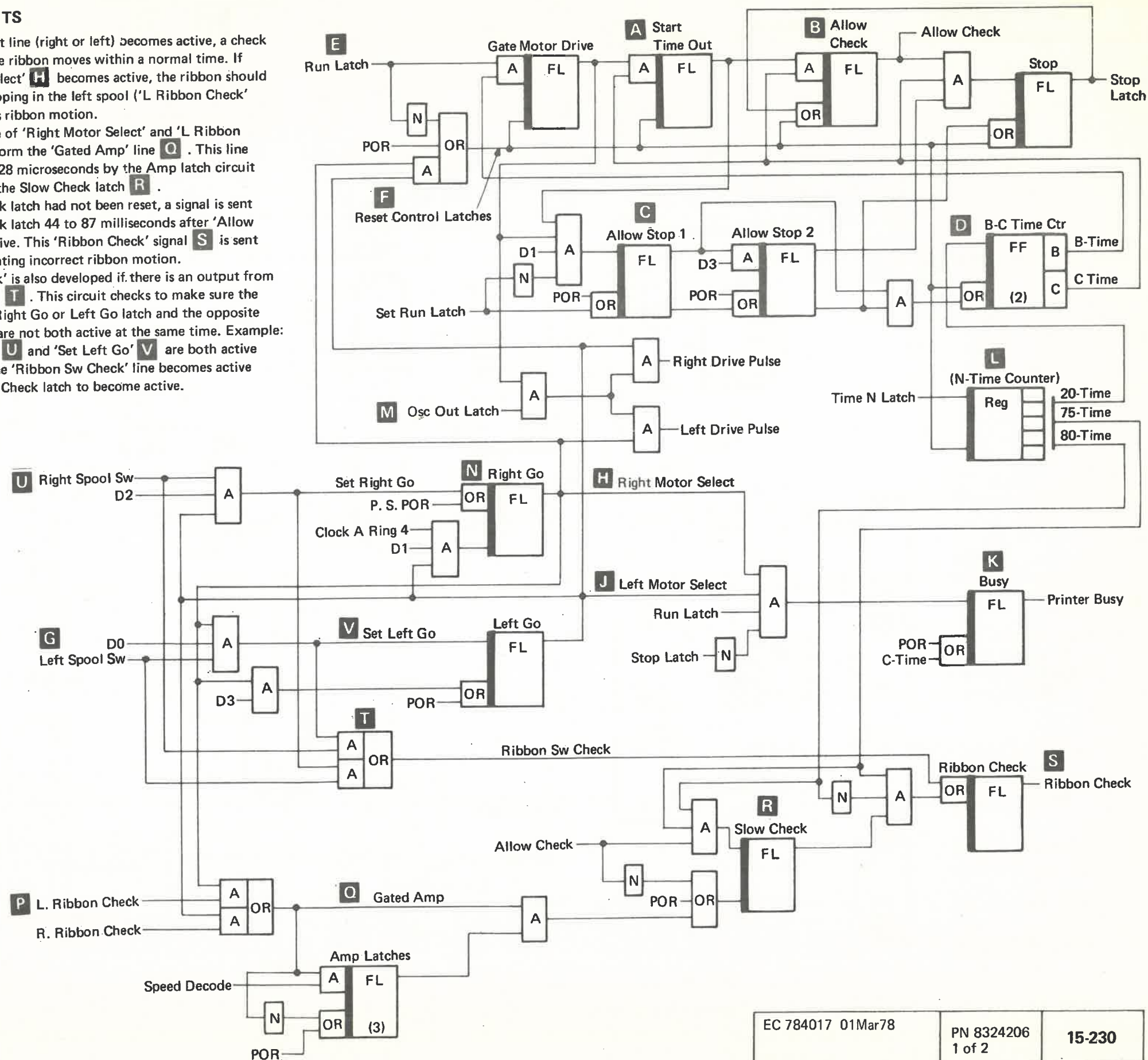
## CHECK CIRCUITS

When a ribbon select line (right or left) becomes active, a check is made to assure the ribbon moves within a normal time. If the 'Right Motor Select' **H** becomes active, the ribbon should move a signal developing in the left spool ('L Ribbon Check' **P**) that indicates ribbon motion.

The combination of 'Right Motor Select' and 'L Ribbon Check' in an AND form the 'Gated Amp' line **Q**. This line is delayed at least 128 microseconds by the Amp latch circuit and is sent to reset the Slow Check latch **R**.

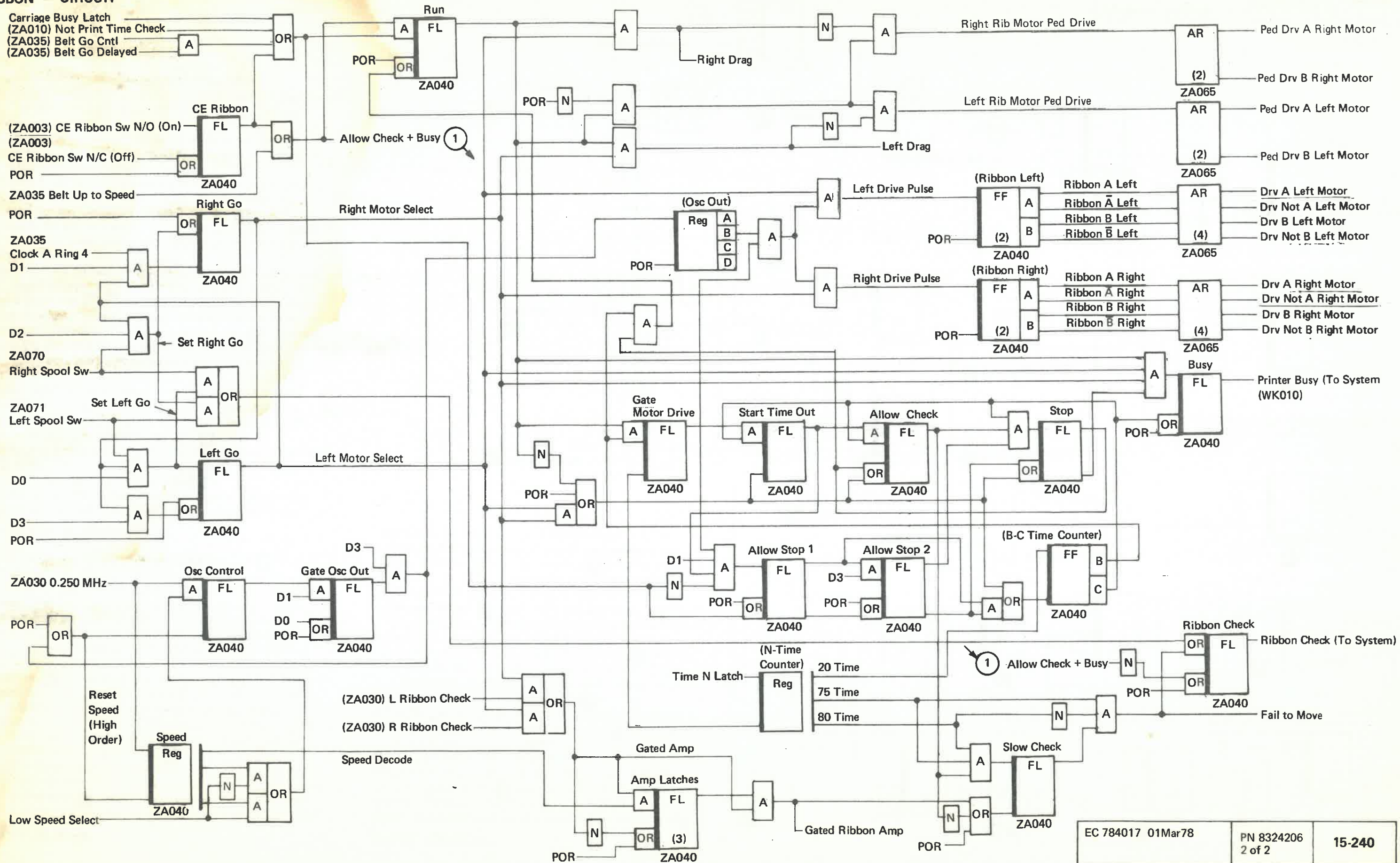
If the Slow Check latch had not been reset, a signal is sent to the Ribbon Check latch 44 to 87 milliseconds after 'Allow Check' becomes active. This 'Ribbon Check' signal **S** is sent to the system indicating incorrect ribbon motion.

A 'Ribbon Check' is also developed if there is an output from the compare circuit **T**. This circuit checks to make sure the set line to either a Right Go or Left Go latch and the opposite spool switch signal are not both active at the same time. Example: If 'Right Spool Sw' **U** and 'Set Left Go' **V** are both active at the same time, the 'Ribbon Sw Check' line becomes active causing the Ribbon Check latch to become active.





## RIBBON - CIRCUIT





## FORMS PATH

### INTRODUCTION

Continuous forms are passed from the load compartment **A**, between the hammers and the ribbon, past the tractors and are stacked in a stacker compartment **H** at the rear of the printer.

The following functional areas of the forms path are briefly described in the following paragraphs:

- Forms Load Compartment **A**
- Forms Entry Guides **B**
- End-of-Forms Switch **C**
- Tension Fingers **D**
- Paper Clamp **E**
- Forms Tractors **F**
- Tinsel **G**
- Stacker Compartment **H**

For more detail of the print area and tractors, see "Carriage", (15-270).  
For removal and replacement of parts, see "Forms Path," Section 7, 7-000.

### FORMS LOAD COMPARTMENT **A**

The forms load compartment holds a stack of forms up to 320 mm (12.5 inches) high.

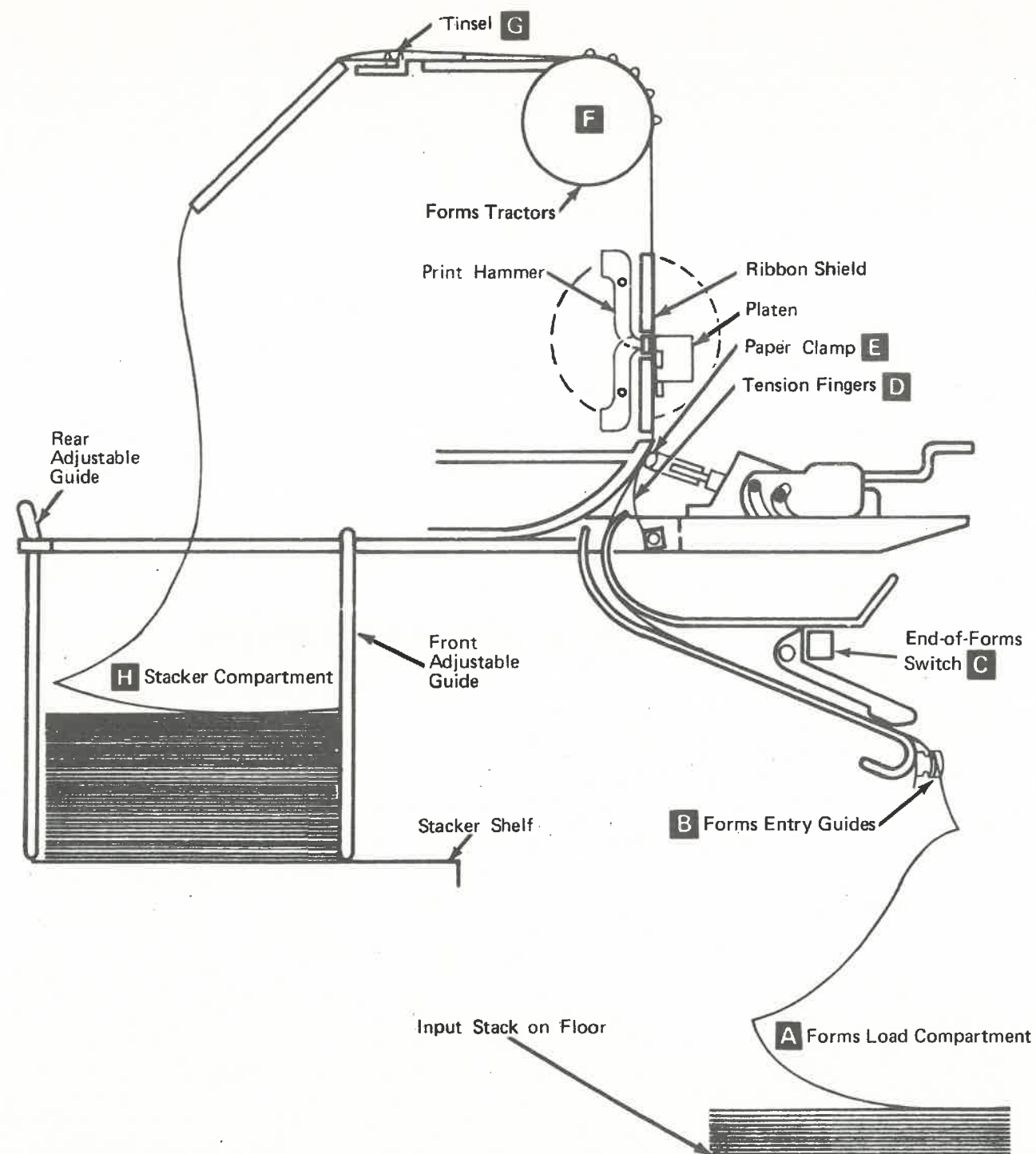
### FORMS ENTRY GUIDES **B**

There are two forms chute guides at the top of the forms load compartment that are used to align the forms as they enter the forms path.

### END-OF-FORMS SWITCH **C**

The End-of-Forms switch senses the absence of forms in the forms chute. It closes when approximately 318 mm (12.5 inches) of forms remain below the print line and a signal is sent to the system. This signal turns on the Forms light in the printer and indicates to the system to finish the command in process, stop the carriage, and turn off the Ready light. This signal remains active as long as there is less than the above amount of paper in the forms path.

If the command in process contains an operation with a carriage skip of four or more lines, the carriage must be stopped within 4 lines to allow operator access to the last form within the forms chute. The operator has the option of completing the remaining forms by depressing the Ready key causing the printer to print and advance until the next line 1 occurs. At this time, it becomes Not Ready (the Ready light turns off).



### TENSION FINGERS **D**

These 6 fingers are located in the forms path before the paper clamp. The fingers ride against the forms and provide a drag to keep the forms under tension through the paper clamp and print unit areas.

The tension on each finger is adjustable by turning a threaded shaft into a clevis. See "Forms Path", Section 7, 7-000.

### PAPER CLAMP **E**

The paper clamp is a solenoid-operated device used to hold the forms so no lateral motion occurs while a line is being printed. This clamp is moved against the paper by a solenoid that is controlled by the 'Activate Paper Clamp' signal from the printer. This clamp signal must be deactivated 6.1 to 7.2 milliseconds before activating 'Carriage Go'. It must be activated within 10 microseconds of the end of 'Carriage Go' or not later than 10 milliseconds before initiation of printing when no carriage motion takes place.

### FORMS TRACTORS **F**

The two pin-feed tractors, mounted on a motor/belt-driven shaft, move the forms through the printer. For more detail, see "Carriage Drive, Tractors" (15-270).

### TINSEL **G**

There is a piece of tinsel strung across the forms path to touch the forms as they pass through the printer. This tinsel removes the static charge on the forms after printing.

### STACKER COMPARTMENT **H**

The stacker compartment, at the rear of the printer, holds the forms after printing. The adjustable front and rear stacker guides may be moved forward and backward to allow forms of various lengths to stack properly. The rear guide pivots so forms can be removed.

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# CARRIAGE

## INTRODUCTION

The IBM 5211 Printer has a tapeless carriage consisting of the following functional units: carriage stepper motor, carriage feedback emitter assembly, tractors, and control logic. The carriage moves continuous forms through the printer. Spacing and skipping of the forms is controlled by the system. Skipping may be done up to 508 mm (20 in.) per second.

*Note:* For removal and adjustment procedure, see "Carriage," Section 8, 8-000.

A signal from the system initiates the movement of forms by gating the first carriage advance pulse from the control circuit. This motor control logic continues to provide pulses to the drive motor until the forms have advanced the proper distance as specified by the system via a 'Carriage Go' signal. At this time, the last three drive pulses are delayed to slow the forms down before being stopped. A small detent current holds the carriage motor in the stopped position.

There are three carriage error conditions sensed by the using system. When any of these conditions occur, the system turns on the Check light and the Forms light on the printer, and turns off the Ready light. The error conditions are as follows:

- *Carriage Check 1* — This check occurs if there are missing or extra carriage advance pulses during a carriage operation.
- *Carriage Check 2 — (Single Space)* This check occurs if the timing between the deactivation of the paper clamp pulse and the deactivation of the paper settling pulse within the system exceeds 34 ms, three or more times during the printing of one page (line 1 to line 1).
- *Forms Jam Check* — The system indicates a forms jam if the signal 'Forms Pulse' is not sensed within the distance of 4 to 6 holes (2 to 3 inches) of forms movement.

## CARRIAGE DRIVE

### Tractors

Two pin-feed tractors **A** move forms through the printer. Each tractor has a cover that holds the forms onto the tractor pins. Hand operated levers **B**, located at the bottom of each tractor, are used to horizontally position the tractors to accommodate various form widths. The left tractor houses a forms motion sensing assembly. When no holes are sensed within approximately 40 to 90 mm (1-1/2 to 3-1/2 in.) of carriage motion, the system detects that forms are not moving properly and the not-ready condition is set.

The forms advance knob **C** is attached to the left end of the tractor shaft. Turning this knob provides coarse vertical adjustment of the forms. For fine vertical adjustment, press the knob in (toward the right) and turn. This adjustment should be made only when the printer is not printing.

### Carriage Motor

The tractors are driven by the carriage motor via a drive belt. This stepper motor is driven by 'Carriage Advance Pulses' developed by the control logic in the printer.

### Feedback Circuit

There is a feedback timing disk **D** mounted on the end of the motor shaft. Slots on this disk, along with a light emitting diode (LED)/phototransistor circuit, provide 'Carriage Feedback' pulses when the disk is turned. These pulses are used to develop the second and following 'Carriage Advance Pulses' that drive the carriage.

### Carriage Detent

This is accomplished electrically by having a small current flow through a resistor network and two of the carriage motor coils because there are always two of the carriage stepper motor drive lines active. Therefore, current flows through the two coils and limiting resistors to +25V. When the carriage advances, the resistance is effectively reduced by the 'Ped Drive' lines before drive pulses are applied to the carriage motor.

## SYSTEM CONTROL

The system program controls all printing and forms movement. 'Carriage Go' is provided by the system and is used to set the circuits to generate the 'Carriage Advance Pulses' which are used to drive the carriage motor.

### Forms Spacing

Forms spacing of either 6 or 8 lines per inch is possible by setting the 6LPI/8LPI switch on the operator's panel or by program control. It takes 48 advance pulses to move the forms one inch; therefore, if set on 6 lines per inch, 8 pulses are needed to move the form one line space. If set on 8 lines per inch, six pulses are needed for one line space.

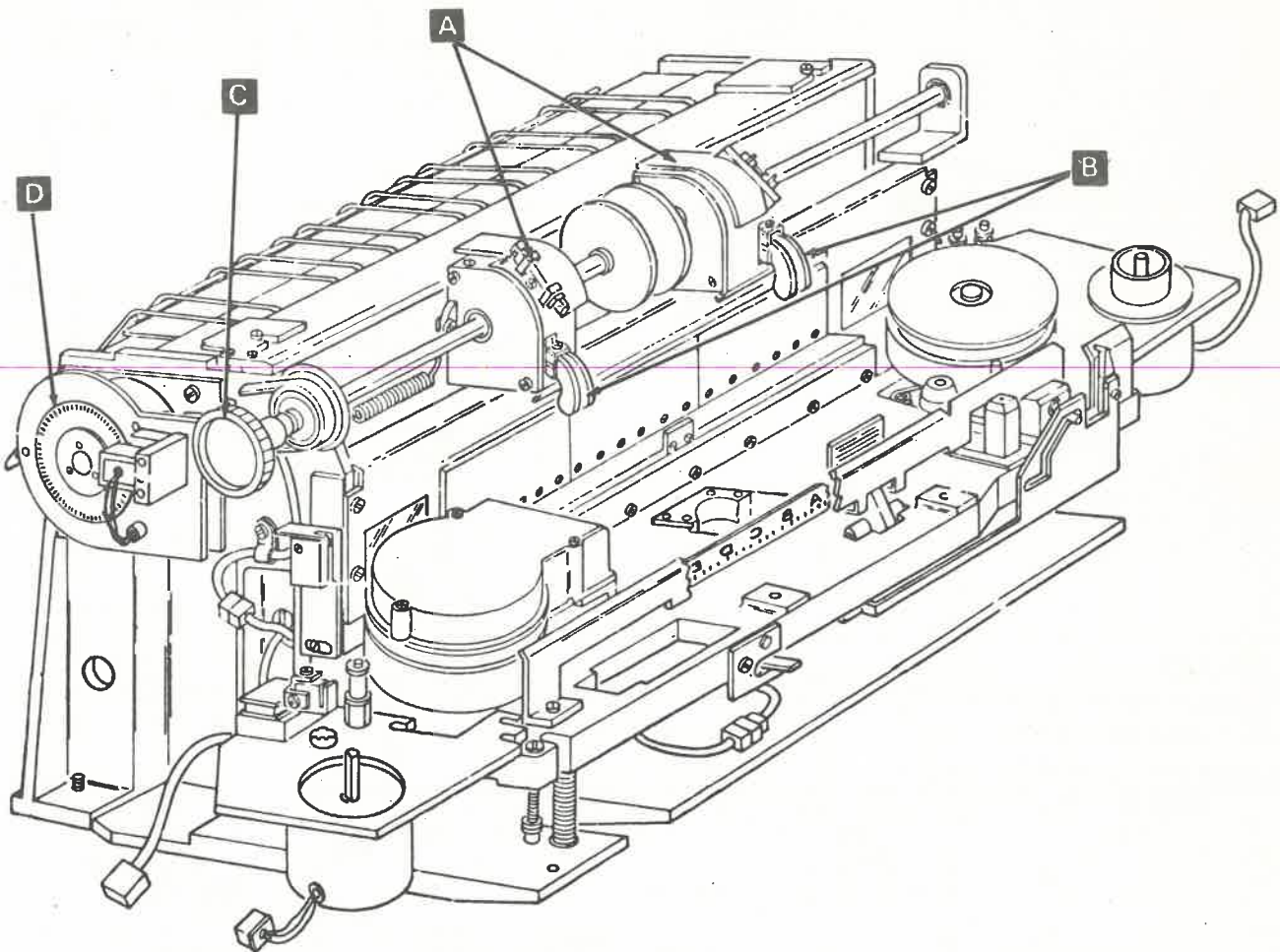
The last three advance pulses of the last line to advance are provided by the 5211. These pulses, called stop pulses, slow the carriage motor down because they are delayed from the normal drive pulses.

### Forms Skipping

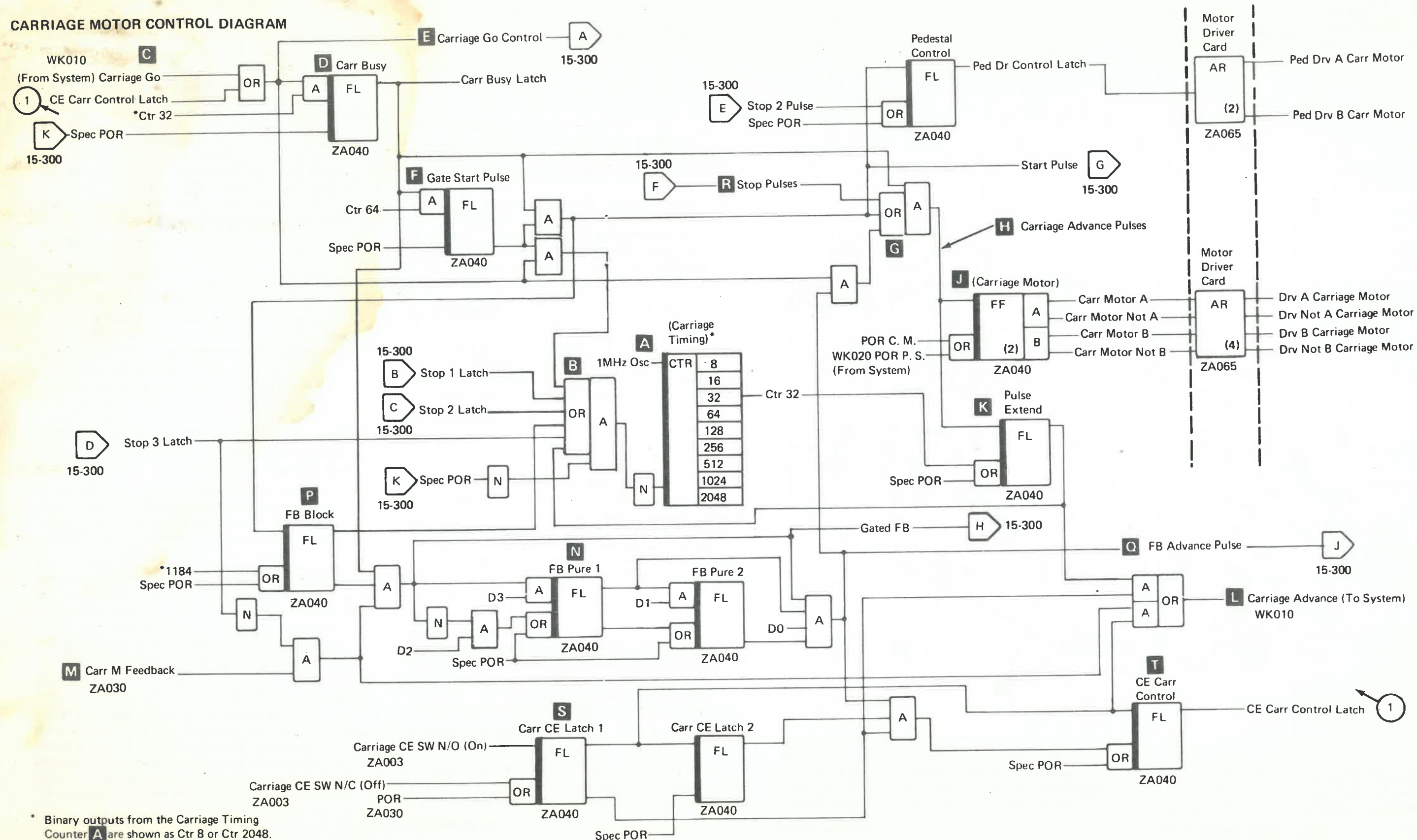
Forms skipping is just a continuation of spacing and may be done up to 508 mm (20 in.) per second. The system always directs the printer (via the 'Carriage Go' signal) to stop skipping one line short of the required amount. The additional line is advanced as a one-line space.

### Forms Control Buffer (FCB)

The forms control buffer in the system is loaded with the number of lines that are on the forms to be used. The line count is updated by the 'Carriage Advance' as the carriage moves the forms. This buffer takes the place of a carriage tape.



# CARRIAGE MOTOR CONTROL DIAGRAM



\* Binary outputs from the Carriage Timing Counter **A** are shown as Ctr 8 or Ctr 2048. Combinations are shown without the Ctr prefix. Example: 704 = Ctr 512 + Ctr 128  
 \* Ctr 64.



CARRIAGE MOTOR CONTROL

Circuit Timing

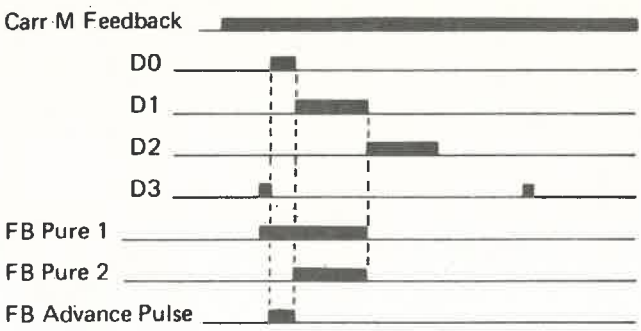
The timing for this circuit depends upon the Carriage Timing counter **A**. This binary counter circuit is unique in that any input to the OR **B** will allow the counter to run. When no signals are present, the counter is reset. Any time 'Spec POR' is active, signals are not gated to the counter and the counter is reset.

Initial Carriage Advance Pulse

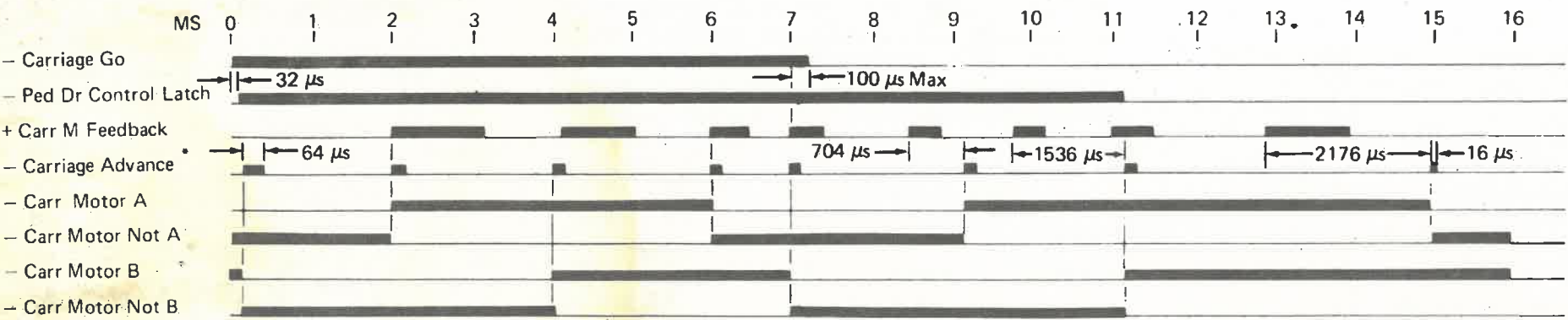
'Carriage Go' **C** from the system activates the Carriage Busy latch **D** after a delay of 32 microseconds. The counter **A** was started when 'Carriage Go Control' **E** was ANDed with the not output from the 'Gate Start Pulse Latch' **F**. 'Carriage Busy Latch' and not 'Gate Start Pulse Latch' are ANDed and fed through an OR **G** to develop a signal 'Carriage Advance Pulses' **H**. This signal drives the Carriage Motor flip flops **J** that pulse the carriage motor. See timing chart of motor phase sequence below. The signal on the 'Carriage Advance Pulses' line **H** also activates the Pulse Extend latch **K** that produces a 32-microsecond 'Carriage Advance' pulse **L** so the system can keep track of the carriage motor advance pulses.

Further 'Carriage Advance' Pulses

When the motor turns, the feedback timing disk moves and a 'Carr M Feedback' pulse **M** is generated by an LED/ phototransistor circuit and used to initiate the next carriage motor advance pulse. 'Carr M Feedback' is gated to the input circuit of the FB Pure 1 latch **N** because 'Carriage Busy' **D** is still active and the FB Block latch **P** turned off at 1184 time. At 'D3' time FB Pure 1 latch is activated conditioning FB Pure 2 latch to turn on at 'D1' time. Before that happens, 'D0' gates 'FB Pure 1', not 'FB Pure 2', and 'Gated FB' to develop a 'FB advance Pulse' **O**. This advance pulse ANDed with 'Carr Go Control' **E** is fed to the OR circuit **G**. This signal and 'Carr Busy' **D** are used to generate the second pulse on the 'Carriage Advance Pulses' line **H** and the motor is stepped again. Carriage advance pulses continue to be developed in the same manner until 'Carriage Go' is deactivated. After 'Carriage Go' becomes inactive there are three additional advance pulses developed, each with an increasing time lag so the carriage slows before it stops. This is done by having 'Carriage Busy' gating 'Stop Pulses' **R** to develop the 'Carriage Advance Pulses'. See "Stop Pulse Development", (15-300).



MOTOR PHASE SEQUENCE TIMING CHART



\* The time of the first and last Carriage Advance pulses are indicated, all others are 32 μs.

Note: All Carr Motor pulses may be 180° from as shown.

Stop Pulse Development

These stop signals are developed as follows: After 'Carriage Go' becomes inactive, it causes 'Carriage Go Control' to become inactive. The next 'Gated FB' pulse **A** starts the FB Stop Counter **B** which had been reset with a 'Start Pulse' when the first carriage advance pulse was developed. This binary counter advances with each 'Gated FB' and develops pulses used to set the three stop latches. Each time a stop latch is activated, the Carriage Timing counter (15-280) is reset. Because the counter operates at 1 MHz, 704 and 720 will be the number of microseconds after Stop 1 latch becomes active.

An FB Stop Counter decode of 2 (2 feedback pulses) and the next 'FB Advance Pulse' **C** turn on Stop 1 latch. This resets the Carriage Timing counter (15-280) so a 'Stop Pulse' **D** is developed 704 microseconds later. This is a 16-microsecond pulse because Stop 1 latch was reset at 720 time. This 'Stop Pulse' is used to develop the next carriage advance pulse. Because this advance pulse was delayed by 704 microseconds the motor slows down. See "Motor Phase Sequence Timing Chart" (15-290).

A decode of 3 turns on Stop 2 latch, resets the counter again, and gates another 16-microsecond pulse to the motor via the 'Stop Pulses' signal at 1536 time further slowing the motor. The Pedestal Control latch (15-280) is reset when 'Stop 2 Pulse' **E** is activated which deactivates the 'Ped Dr Control Latch' line removing the pedestal voltage from the drive motor. This forces the motor to slow down even more with the following advance pulse.

The next advance pulse is developed following the development of the 'Stop 3 Latch' pulse. This pulse is active after a decode of 5 (5 feedback pulses). At 2176 microseconds later, a signal is placed on the 'Stop Pulses' line and is used to make another carriage advance pulse. Because of the increased delay, the carriage motor is slowed even more.

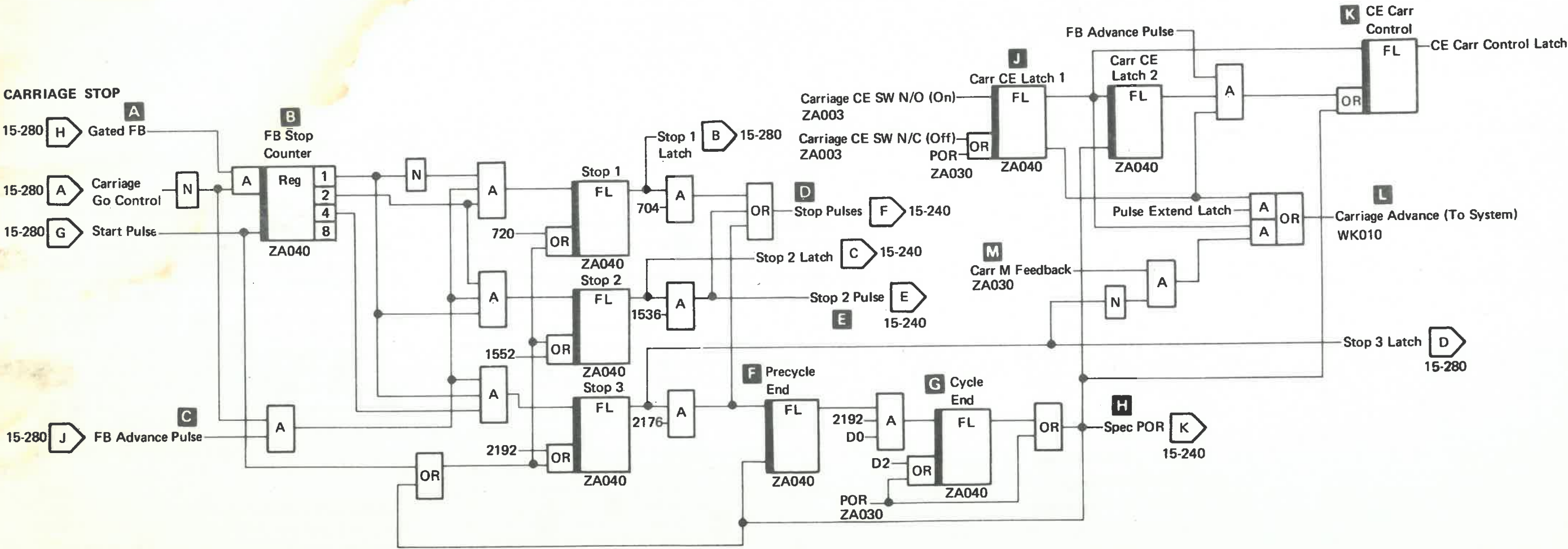
Also at this time, the Precycle End latch **F** is activated. After 16 microseconds Cycle End latch **G** is activated and 'Spec POR' line **H** is developed. 'Spec POR' resets the complete circuit and prevents any more drive pulses from being sent to the carriage drive motor.

Carriage CE Switch Circuit

The carriage also advances when the Carriage CE switch is turned on activating Carr CE Latch 1 **J**. The output from this latch activates the CE Carr Control latch **K**. Its output, 'CE Carr Control Latch' signal, takes the place of 'Carriage Go' from the system and activates the Carr Busy latch.

The circuit then functions the same as if 'Carriage Go' were present except for the development of the 'Carriage Advance' pulses **L** sent to the system. In this case, these pulses are developed by the output from the Carr CE Latch 1 **J** ANDed with a signal which is 'Carr M Feedback' **M** ANDed with not 'Stop 3 Latch'.

Turning Carriage CE switch off slows the carriage and stops it as was explained in "Stop Pulse Development".





PRINT AND SPACE OPERATION

MODEL-1

This page describes the functions and the timing relationships for printing and carriage movement for the IBM 5211 Model-1 Printer. The example is based on using a 48-character set print belt and 6 lines-per-inch forms spacing.

The print and space cycle takes approximately 375 milliseconds for Model-1 with the printing portion and spacing portion taking approximately 345 and 30 milliseconds, respectively.

System Setup

The following conditions are active before starting to print:

- The belt image is loaded in the UCSB (Universal Character Set Buffer) in the system.
- The forms image is loaded in the FCB (Forms Control Buffer) in the system.
- The system is synchronized with the printer with the "home" pulse that was developed from the home position on the print belt.
- The system has Model-1 status loaded.

When the system has data to print, the user's program issues a print command, which loads a block of data in the PLB. The block includes data to be printed as well as additional commands used by the printer attachment to perform printer-related tasks such as setting the left-most print position and forms spacing/skipping controls.

The system activates the paper clamp to prevent forms movement during printing.

Printing Odd-Numbered Print Positions

The printer and system execute 240-odd print subscans (5 for each character in the character set) to address the hammers. The system activates 240 fire-tier pulses to fire the hammers to print the characters in the odd-numbered print positions.

The print subscans provide the timing relationship between the print belt and the system. Each print scan has 5 print subscans that follow in sequence: 1-2-3-4-5, then repeat. The print subscan pulses are sent from the printer to the system. The system develops fire-tier pulses that also follow in sequence: 1-2-3-4-5, then repeat. Each fire tier is assigned to fire certain hammers. For example, Fire Tier 1 always fires hammers for print positions 1, 11, 21, etc. during the 48-odd print scans.

During subscan 1, the system compares the characters in the PLB that are to be printed in print positions 1, 11, 21, etc. with the characters in the UCSB that represent the characters on the belt that are physically aligned with print positions 1, 11, 21, etc. If these two characters are equal, the system sends the correct data bits to the printer to address the hammer. The printer performs a parity check on the address. The system sends a strobe pulse for each valid hammer address, and sets the correct hammer latch.

After the latches are set, Fire Tier 1 is activated by the system. Fire Tier 1 is timed to fire the hammers that are aligned with print positions 1, 11, 21, etc. Fire Tier 1 ANDs with the hammer latches that are turned on to activate the hammer driver(s), firing the hammers.

During each fire tier time, the system activates hammer sample pulses that perform hammer echo checking. Any hammer that

is fired responds to its hammer sample pulse by activating the 'Hammer Echo Return' signal to the system. For example, if 3 hammers are fired, the hammer echo return signal is activated 3 times.

These procedures are repeated for each of the 240-odd subscans:

- Subscan and Fire Tier pulse generation
- Comparing data with print belt to address the hammers
- Firing the hammer(s) and echo checking

Note that portions of the addressing and firing overlap. For example, when Fire Tier 1 is active and firing hammers 1, 11, 21, print subscan 2 is active and addressing hammer latches 3, 13, 23. These latches are fired by the Fire Tier 2 pulse.

After subscan 5 of print scan 48 is completed, the system waits for 15 print subscans before starting the 48-even print scans. This allows time for hammer settling between printing the odd-numbered print positions and printing the even-numbered print positions.

Printing Even-Numbered Print Positions

The printer and system execute 240-even print subscans to address the hammers. The system activates 240 fire tier pulses to fire the hammers to print the characters in the even-numbered print positions.

The subscan and fire tier pulses follow in the same order as the odd print scans. The same functions are executed: comparing data for hammer addressing, firing, and echo checking.

After the 48-even print scans, the print portion of the operation is done.

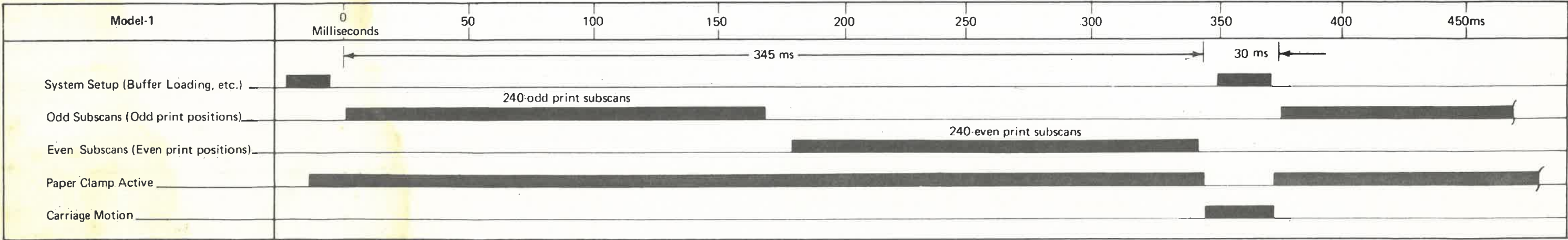
Forms Movement

When the 48th print scan is completed, the system deactivates the paper clamp to allow forms movement. At this time, the system activates 'Carriage Go' to the printer which develops 8 carriage advance pulses. These pulses are used to drive or "step" the carriage motor and are also returned to the system to update the line count in the FCB and to verify carriage motion. The carriage motor moves the forms 1/6 inch.

The system activates the paper clamp to hold the forms for the next print line.

The sequence of 48-odd and 48-even print scans and forms movement is repeated for each print line.

PRINT AND SPACE TIMING MODEL-1



MODEL-2

This page describes the functions and the timing relationships for printing and carriage movement for the IBM 5211 Model-2 Printer. The example is based on using a 48-character set print belt and 6 lines-per-inch forms spacing.

The print and space cycle takes approximately 200 milliseconds for Model-2 with the printing portion and spacing portion taking approximately 170 and 30 milliseconds, respectively.

System Setup

The following conditions are active before starting to print:

- The belt image is loaded in the UCSB (Universal Character Set Buffer) in the system.
- The forms image is loaded in the FCB (Forms Control Buffer) in the system.
- The system is synchronized with the printer with the "home" pulse that was developed from the home position on the print belt.
- The system has Model-2 status loaded.

When the system has data to print, the user's program issues a print command, which loads a block of data in the PLB. The block includes data to be printed as well as additional commands used by the printer attachment to perform printer-related tasks such as setting the left-most print position and forms spacing/skipping controls.

The system activates the paper clamp to prevent forms movement during printing.

Printing

The printer and system execute 240 print subscans (5 for each character in the character set) to address the hammers. The system activates 240 fire-tier pulses to fire the hammers to print the characters.

The print subscans provide the timing relationship between the print belt and the system. Each print scan has 5 print subscans that follow in sequence: 1-2-3-4-5, then repeat. The print subscan pulses are sent from the printer to the system. The system develops fire-tier pulses that also follow in sequence: 1-2-3-4-5, then repeat. Each fire tier is assigned to fire certain hammers. For example, Fire Tier 1 always fires hammers for print positions 1, 6, 11, 16, etc.

During subscan 1, the system compares the characters in the PLB that are to be printed in print positions 1, 6, 11, 16, etc. with the characters in the UCSB that represent the characters on the belt that are physically aligned with print positions 1, 6, 11, 16, etc. If these two characters are equal, the system sends the correct data bits to the printer to address the hammer. The printer performs a parity check on the address. The system sends a strobe pulse for each valid hammer address, and sets the correct hammer latch.

After the latches are set, Fire Tier 1 is activated by the system. Fire Tier 1 is timed to fire the hammers that are aligned with print positions 1, 6, 11, 16, etc. Fire Tier 1 ANDs with the hammer latches that are turned on to activate the hammer driver(s), firing the hammer(s).

During each fire-tier time, the system activates hammer sample pulses that perform hammer echo checking. Any hammer that is fired responds to its hammer sample pulse by activating the 'Hammer Echo Return' signal to the system. For example, if 3 hammers are fired, the hammer echo return signal is activated 3 times.

These procedures are repeated for each of the 240 subscans:

- Subscan and Fire-Tier pulse generation
- Comparing data with print belt to address the hammers
- Firing the hammer(s) and echo checking.

Note that portions of the addressing and firing overlap. For example, when Fire Tier 1 is active and firing hammers 1, 6, 11, 16, etc. print subscan 2 is active and addressing hammer latches 3, 8, 13, 18, etc. These latches are fired by the Fire Tier 2 pulse.

After the 48-even print scans, the print portion of the operation is done.

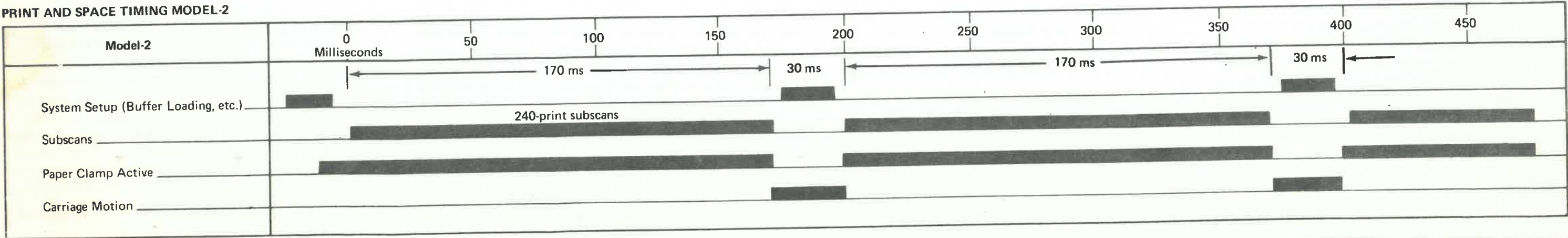
Forms Movement

When the 48th print scan is completed, the system deactivates the paper clamp to allow forms movement. At this time, the system activates 'Carriage Go' to the printer which develops 8 carriage advance pulses. These pulses are used to drive or "step" the carriage motor and are also returned to the system to update the line count in the FCB and to verify carriage motion. The carriage motor moves the forms 1/6 inch.

The system activates the paper clamp to hold the forms for the next print line.

The sequence of 48-print scans and forms movement is repeated for each print line.

PRINT AND SPACE TIMING MODEL-2





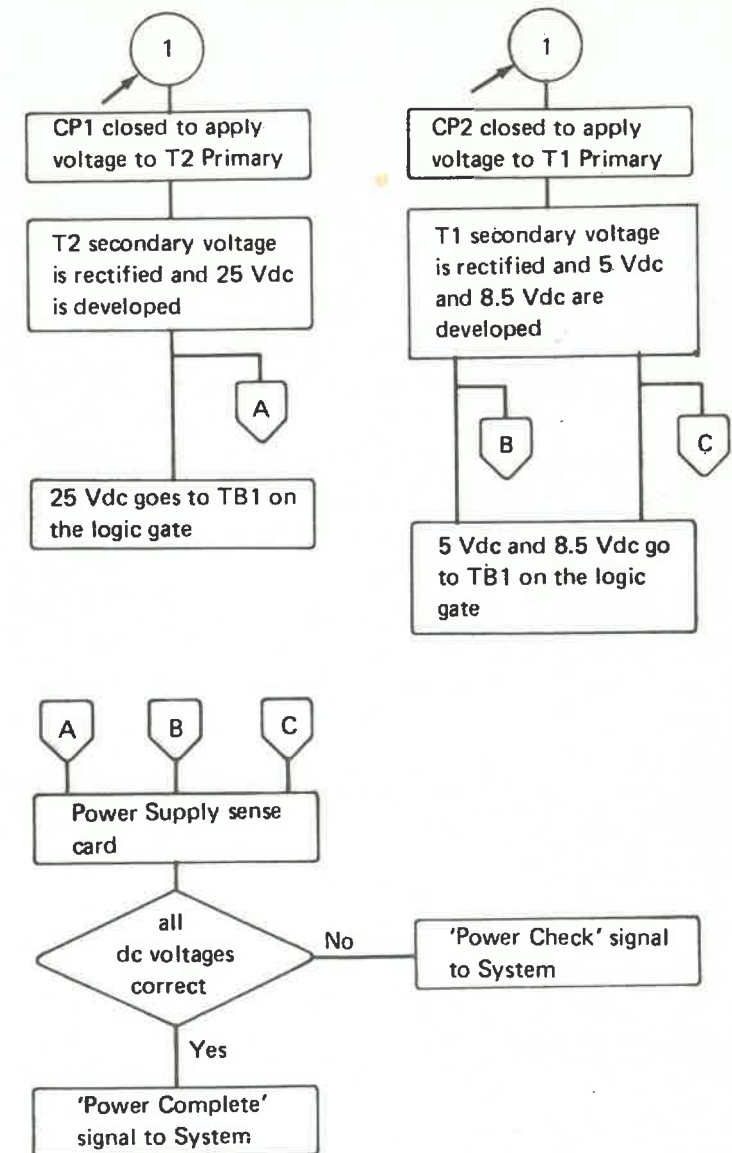
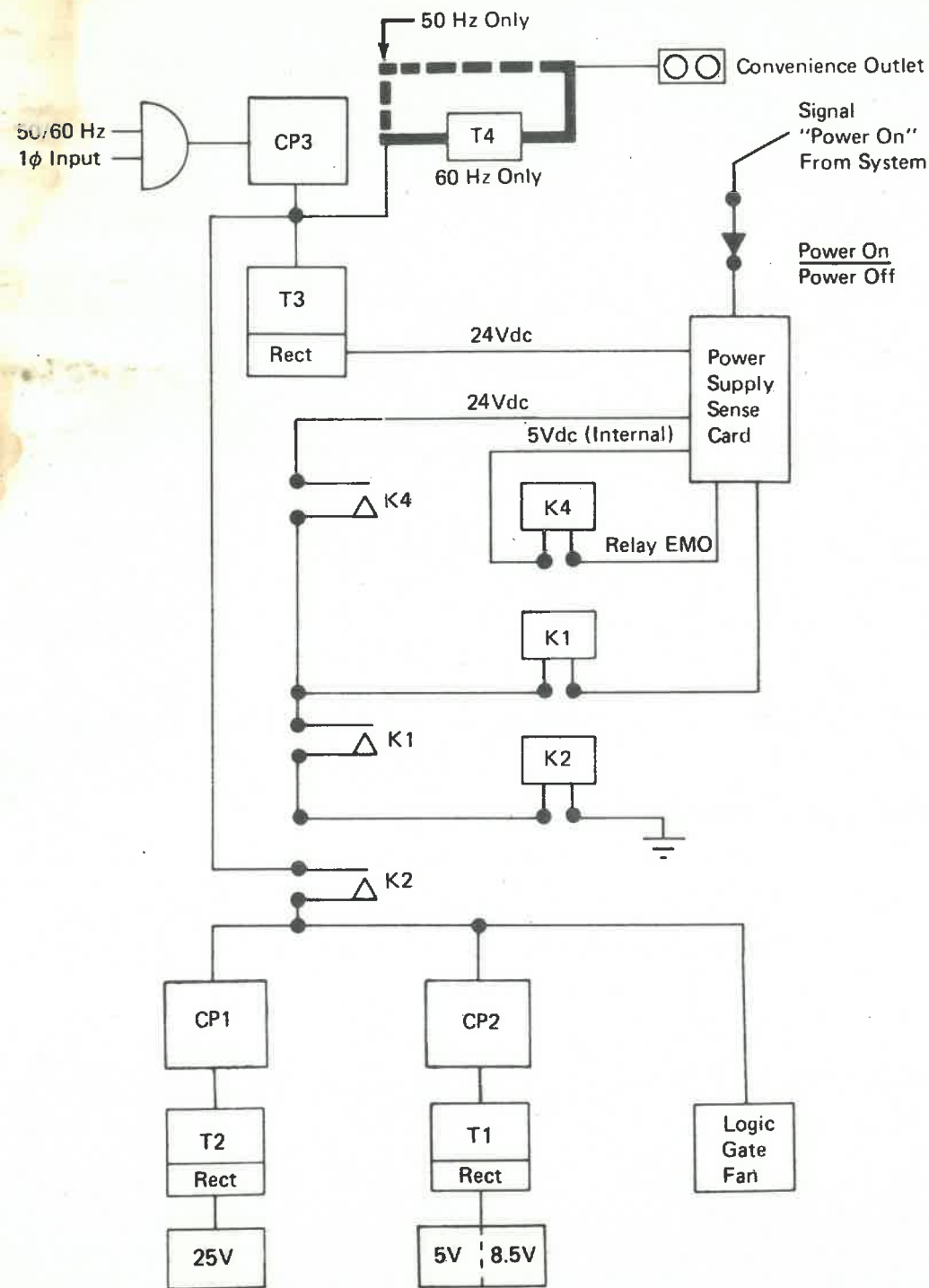
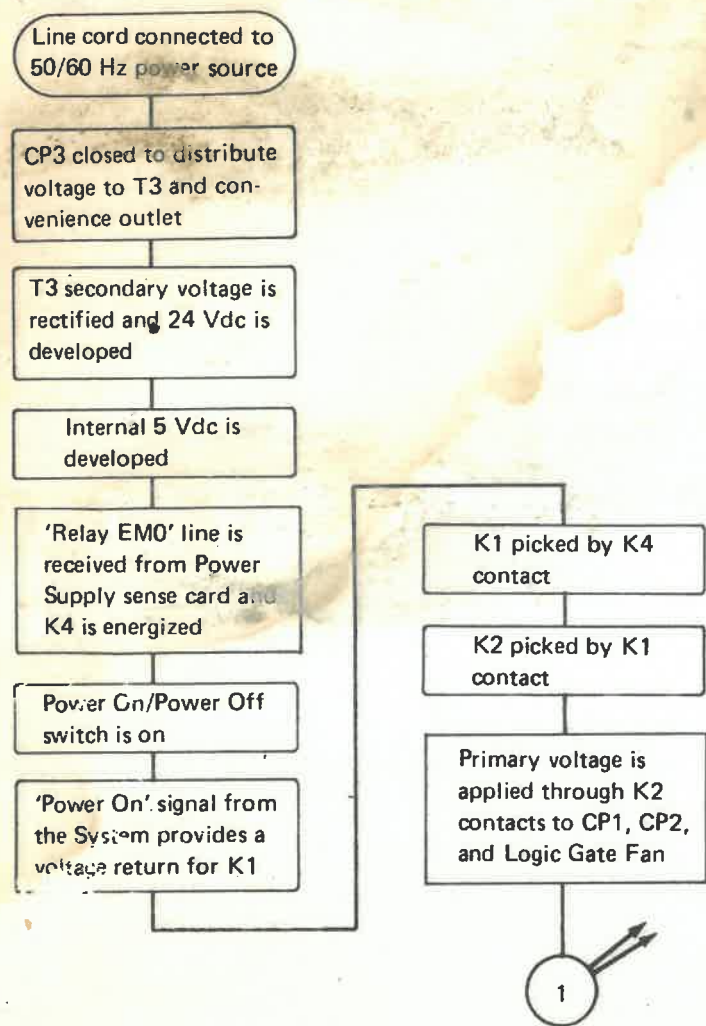
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POWER SUPPLY — LEVEL 2

INTRODUCTION

The 5211 Power Supply develops the 25 Vdc, 8.5 Vdc, and the 5 Vdc for the printer circuits and control logic. The 'Power On' signal from the System activates the 5211 power supply when the Power On/Power Off switch is turned on. When all three dc voltages are correct, a 'Power Complete' signal is sent to the System. If any voltage fails, a 'Power Check' signal is sent to the System. For detail on removal and replacement of the Power Supply, see Section 9, 9-000.

POWER ON SEQUENCE



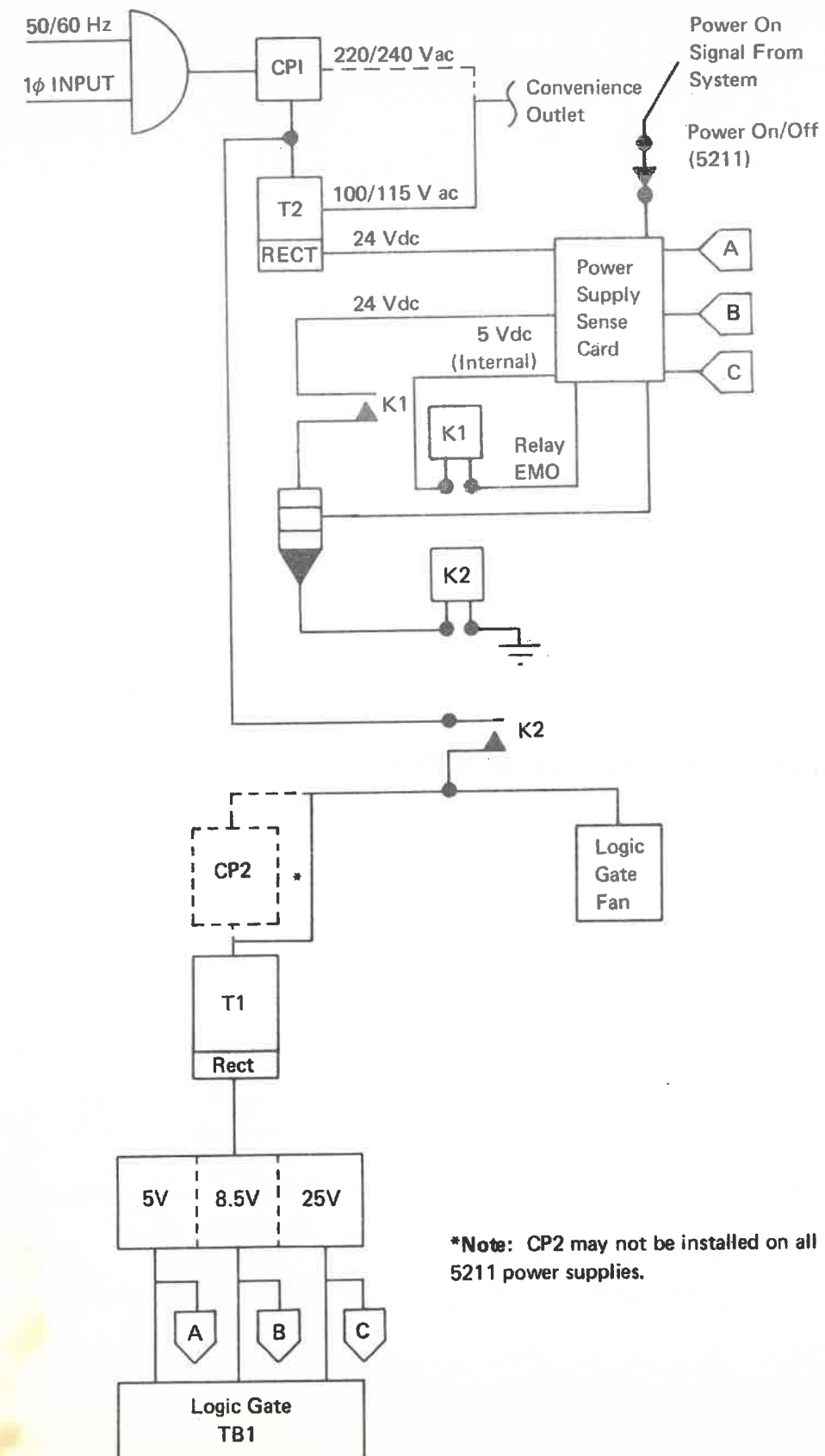


### POWER SUPPLY – LEVEL 3

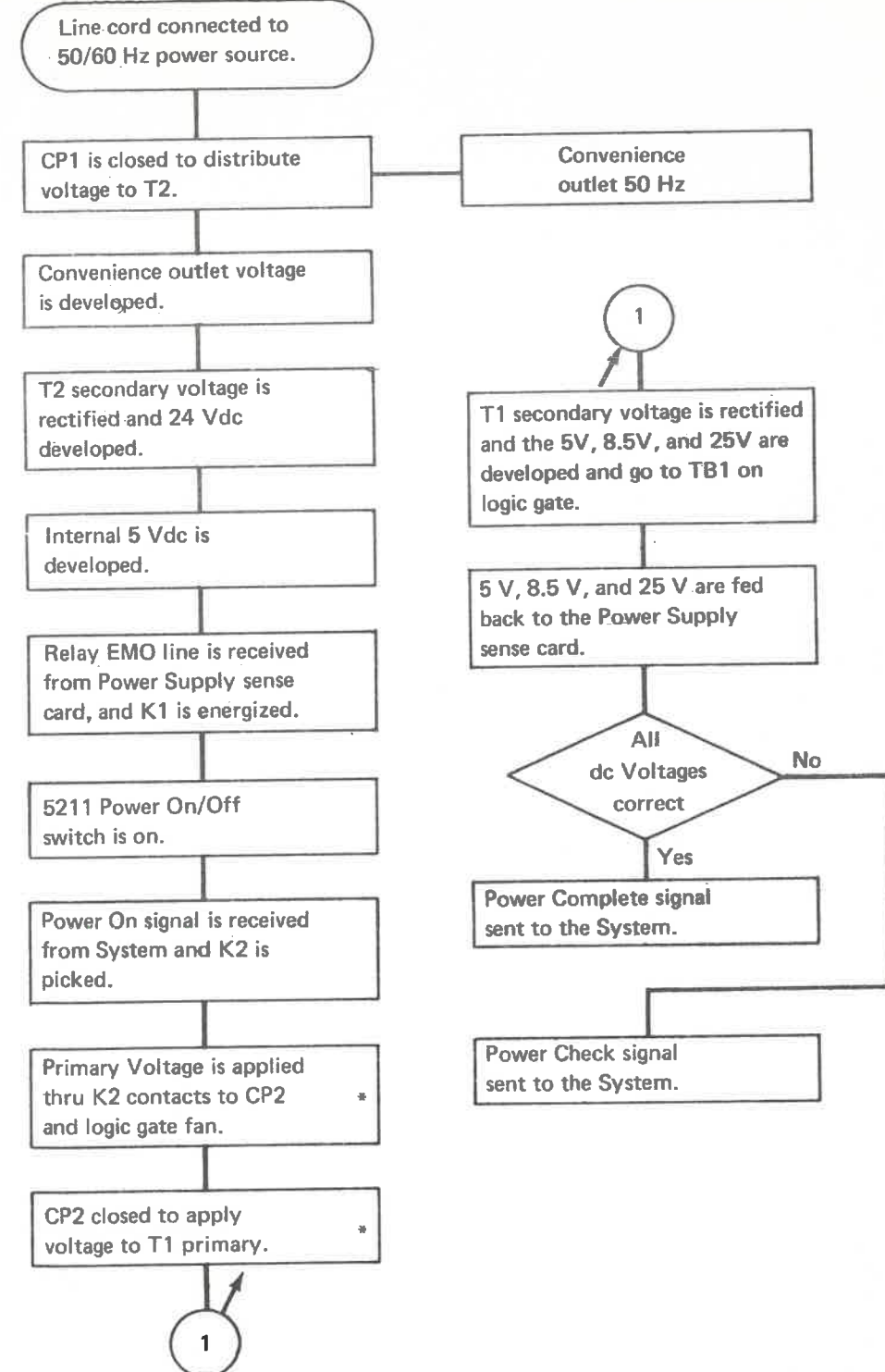
## INTRODUCTION

The 5211 Power Supply develops the 5 Vdc, 8.5 Vdc, and the 25 Vdc for the printer circuits and logic control. The Power On signal from the System activates the 5211 power supply when the Power On/Off switch is turned on. When all three dc voltages are correct, a Power Complete signal is sent to the System. If any dc voltage fails, a power Check signal is sent to the System and the power supply is turned off. For detailed instructions on removal and replacement of the Power Supply, see Section 9, 9-000. Refer to Section 18 (YF001) for power supply circuitry.

**Note:** power supply Power On Reset (POR) is active during power up.



## POWER ON SEQUENCE



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SECTION 16: DIAGNOSTIC DESCRIPTIONS

INTRODUCTION

The IBM 5211 Printer is tested by seven (7) basic Function and Timing diagnostic tests:

Function Tests

- Matrix Print
- Ripple Print
- Character Print
- Carriage Space/Skip

Timing Tests

- Impression Control Single Shot (IMPSS)
- Belt Motor Feedback LED
- Carriage Motor Feedback LED

All diagnostic programs are invoked and run at the system level. The using system may have more than the basic seven diagnostic tests (Example: System/34 "Blink Console Lights"—5211 Operator Panel Lamp Test). For any additional diagnostic test descriptions and operating procedures, refer to the System Maintenance library.

This section of the Maintenance Information Manual (MIM) contains descriptive information, ONLY. Sample printouts are provided as required. NO OPERATING PROCEDURES are included. For detailed operating procedures see the using system Maintenance Documentation.

FUNCTION TESTS

MATRIX PRINT

This diagnostic program addresses and prints one character per print position, per line, starting in print position 1 and ending in print position 132. A sample printout of this diagnostic test can be found on 16-020. This test is commonly used by the CE to isolate hammer addressing problems. This diagnostic ends automatically after printing 132 lines.

RIPPLE PRINT

A pattern consisting of every character in the System's UCSB (belt image) is printed in all 132 print positions. CE intervention is required to end this diagnostic test. The Ripple Print program is used to check overall 5211 print quality, printer operation, and normal single-space forms movement. See 16-030 for a sample printout of this test.

CHARACTER PRINT

This diagnostic function test allows the CE to select a single character (including blanks) to be printed in any single print position or in all 132 positions. An example of the "Character Print" diagnostic test is found on 16-040. (This example uses the character "H" in all 132 positions.) Manual intervention by the CE is required to end this test. The "Character Print" test can be used to check print quality, or during adjustment of hammer-flight time and the PSS Emitter Assembly.

CARRIAGE SPACE/SKIP

This function test checks the overall forms movement and handling capabilities of the 5211 printer. The CE can select either 6 LPI or 8 LPI operation. The sample printout of this test (see 16-050) was obtained using 8 LPI mode. The diagnostic program starts with a single space command and progresses through 2, 4, 8, 16, and 32 line space commands. This test normally ends after the 32 line space operation, but the CE has the option to loop this routine if so desired.

TIMING TESTS

IMPRESSION CONTROL SINGLE SHOT (IMPSS)

This Timing Test allows the CE to measure the Impression Control Single Shot (IMPSS). If the IMPSS timing is found to be outside recommended timing limits, this test can be used to adjust the IMPSS Potentiometer. Refer to Section 5, 5-000 for necessary detailed maintenance information.

BELT MOTOR FEEDBACK LED

To check the first Belt Motor Feedback LED pulse, run this diagnostic timing test. Because CE Switch 1—BELT GO has to be ON, manual intervention by the CE is required. This test is also used to measure and adjust the Belt Motor LED assembly. For all service check and adjustment procedure information, see Section 4, 4-000.

CARRIAGE MOTOR FEEDBACK LED

The CE uses this timing test to perform the "Carriage Motor Feedback LED" service check and adjustment procedure. CE Switch 2--CARR must be ON, and the forms should be removed from the tractors. All start and stopping of this test is performed either at the 5211 Printer or, the using system. For detailed maintenance procedures see, Section 8, 8-000.

SAMPLE-MATRIX PRINT TEST

1  
2  
3  
4  
5  
6  
7  
8  
9  
0  
1  
2  
3  
4  
5  
6  
7  
8  
9  
0  
1  
2  
3  
4  
5  
6  
7  
8  
9  
0  
1  
2  
3  
4  
5  
6  
7  
8  
9  
0

Note: This test prints 132 lines and ends automatically.

4  
5  
6  
7  
8  
9  
0  
1  
2  
3  
4  
5  
6  
7  
8  
9  
0  
1  
2  
3  
4  
5



[illegible]







SAMPLE--CARRIAGE SPACE/SKIP TEST  
(8 Lines Per Inch)

CARRIAGE SPACE/SKIP TEST AT 8 LINES PER INCH

---- CARRIAGE WILL SPACE/SKIP 1 LINES / 0.13 INCHES ----  
---- CARRIAGE WILL SPACE/SKIP 2 LINES / 0.25 INCHES ----  
---- CARRIAGE WILL SPACE/SKIP 4 LINES / 0.50 INCHES ----

---- CARRIAGE WILL SPACE/SKIP 8 LINES / 1.00 INCHES ----

---- CARRIAGE WILL SPACE/SKIP 16 LINES / 2.00 INCHES ----

---- CARRIAGE WILL SPACE/SKIP 32 LINES / 4.00 INCHES ----

----- LAST LINE -----

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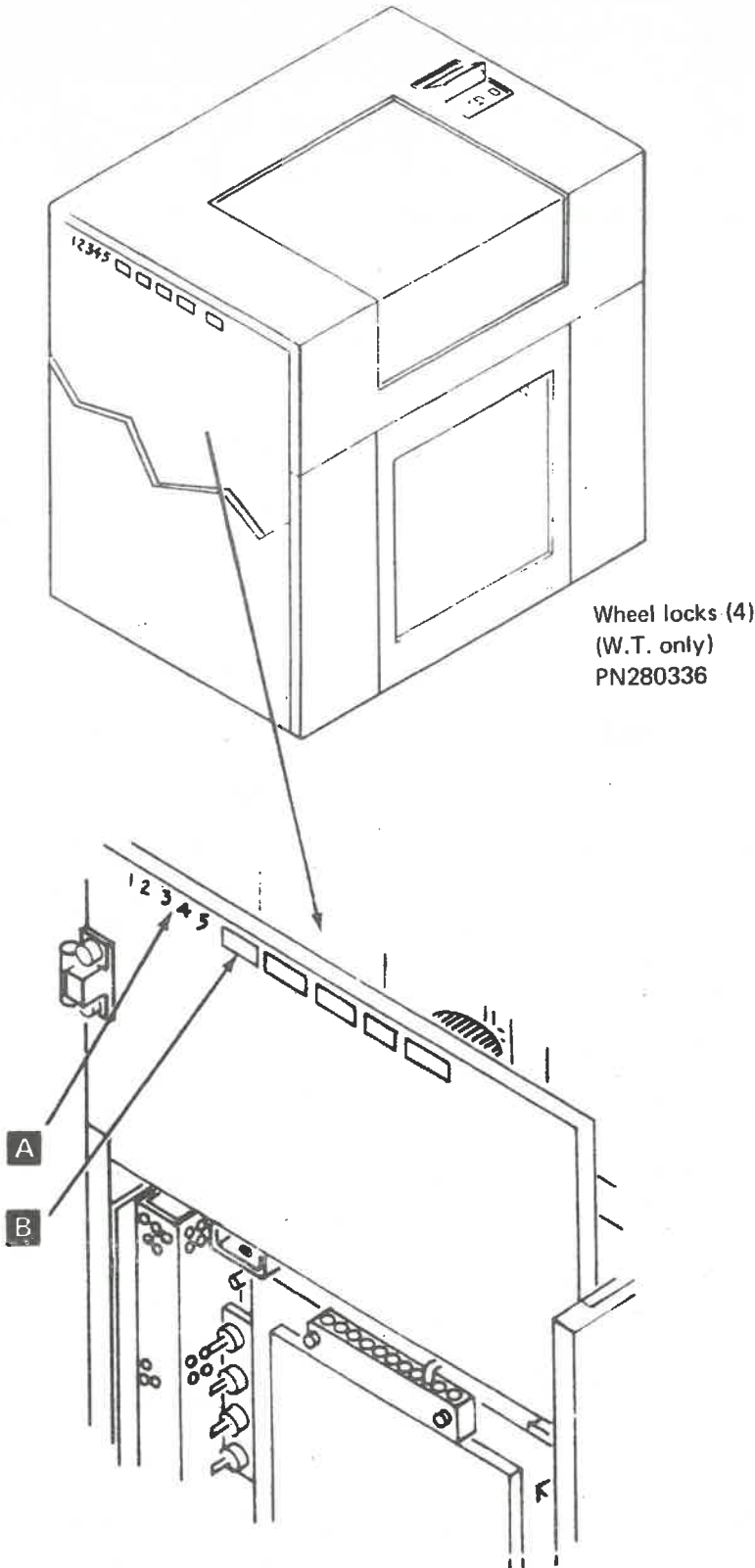
# SECTION 17: INSTALLATION INSTRUCTIONS

The following procedure should be used when installing the IBM 5211 Printer. Only one person is required and no special tools are necessary.

- Be sure to report any problems encountered using the appropriate major, minor, and cause codes on the Installation Activity Document (IAD)-US, or the Technical Action Report (TAR)-World Trade.
- Check each step as it is performed.

## PRE-INSTALLATION

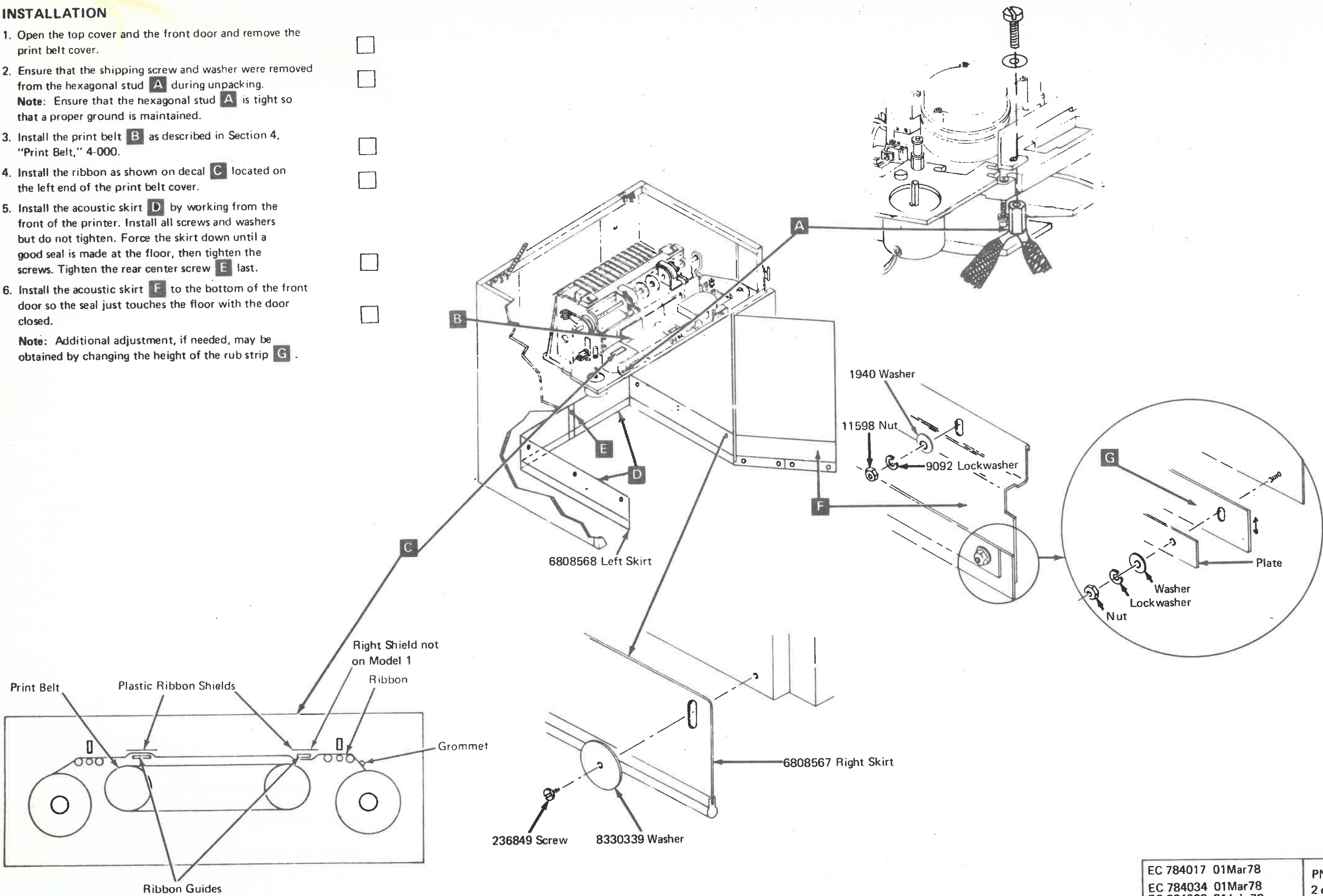
1. Follow the unpacking instructions taped to the top of the printer. ☐
2. Move the printer to its installation site. (If the system is installed on a raised floor, a floor cutout for the cables should be located under each end section of the printer.) ☐
3. Open the covers and inspect for physical damage resulting from shipment. ☐
4. Verify the serial number stamped on the frame of the printer **A** and on the serial number plate **B** with the number on the machine history. ☐
5. Verify that the following items were shipped with the printer, and that the contents are complete: ☐
  - a. Shipping Group, B/M 1815101. ☐
  - b. Print Belt(s). ☐



# INSTALLATION

1. Open the top cover and the front door and remove the print belt cover. ☐
2. Ensure that the shipping screw and washer were removed from the hexagonal stud **A** during unpacking. ☐  
**Note:** Ensure that the hexagonal stud **A** is tight so that a proper ground is maintained.
3. Install the print belt **B** as described in Section 4, "Print Belt," 4-000. ☐
4. Install the ribbon as shown on decal **C** located on the left end of the print belt cover. ☐
5. Install the acoustic skirt **D** by working from the front of the printer. Install all screws and washers but do not tighten. Force the skirt down until a good seal is made at the floor, then tighten the screws. Tighten the rear center screw **E** last. ☐
6. Install the acoustic skirt **F** to the bottom of the front door so the seal just touches the floor with the door closed. ☐

**Note:** Additional adjustment, if needed, may be obtained by changing the height of the rub strip **G**.



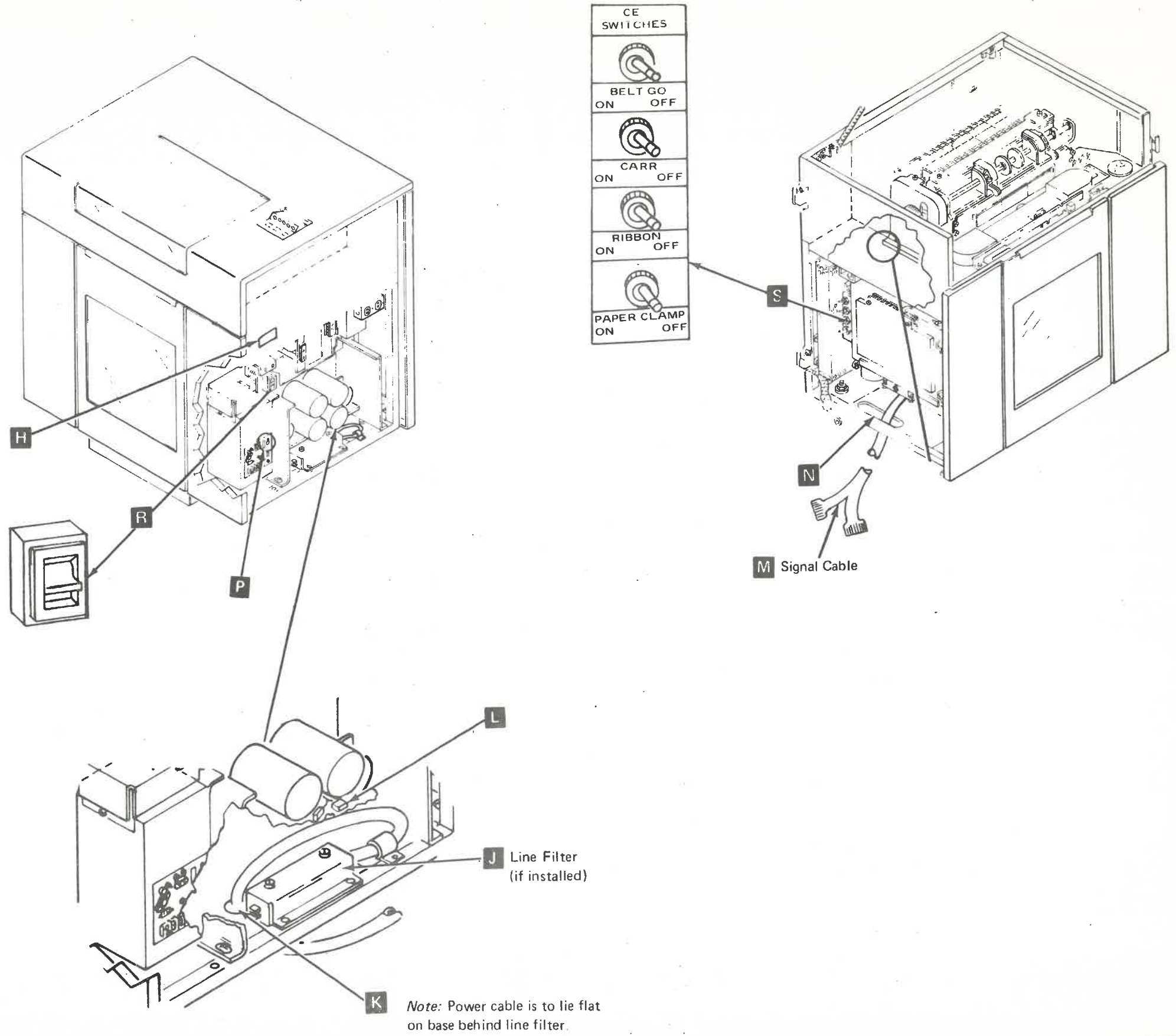


7. Verify that the voltage wiring on the 5211 power supply matches the customer's power. See "Voltage Selection", Section 9, 9-000. Change the transformer wiring on the transformer taps, and change the voltage level **H** if needed. ☐
8. The ac line cord is located inside the right end of the printer. Push the plug end behind the line filter **J** if installed, under the power supply, and through the hole **K** in the bottom of the printer. ☐
- Note:** Leave the 2 'P/S test' plugs **L** disconnected. They are used only when diagnosing failures in the power supply.
9. Open the left end cover and the logic gate. Unwind the signal cable **M**. Ensure that the cable connectors and logic cards are securely seated in the gate. Verify that the pins on the system end of the signal cable are not damaged. ☐
10. Push the system end of the cable through the hole **N** in the bottom of the printer and then to the system. ☐
11. Verify the following: ☐
- a. Circuit protector(s) (CP) are ON. **P** ☐
  - b. Power On/Power Off switch is OFF (down). **R** ☐
  - c. CE switches are OFF. **S** ☐
12. Install forms in the printer by referring to the *IBM 5211 Printer Models 1 and 2 Component Description and Operator's Guide* order no. GA24-3658. ☐
13. See the System Installation Instructions for connecting the signal cable to the system and running printer diagnostics. ☐

**CAUTION:** Do not connect the power plug to the customer's power source or turn on the Power On/Power Off (Instant Power Off) switch **R** until the signal cable **M** is connected to the system.

**AFTER INSTALLATION**

1. Ensure that the customer has the IBM 5211 Printer Component Description and Operator's Guide order number GA24-3658. ☐
2. Assist the customer with checkout of the printer. ☐
3. Complete all installation records and report installation complete to the Branch Office dispatcher. ☐
4. Dispose of shipping and packing materials locally. ☐



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EC 784017 01Mar78  
EC 784068 31July78

PN 8324216  
2 of 2

17-040



SECTION 18: PRINTER WIRING DIAGRAMS — MODEL 1

SECTION CONTENTS

•This section contains the following point-to-point 5211 Printer Wiring Diagrams:

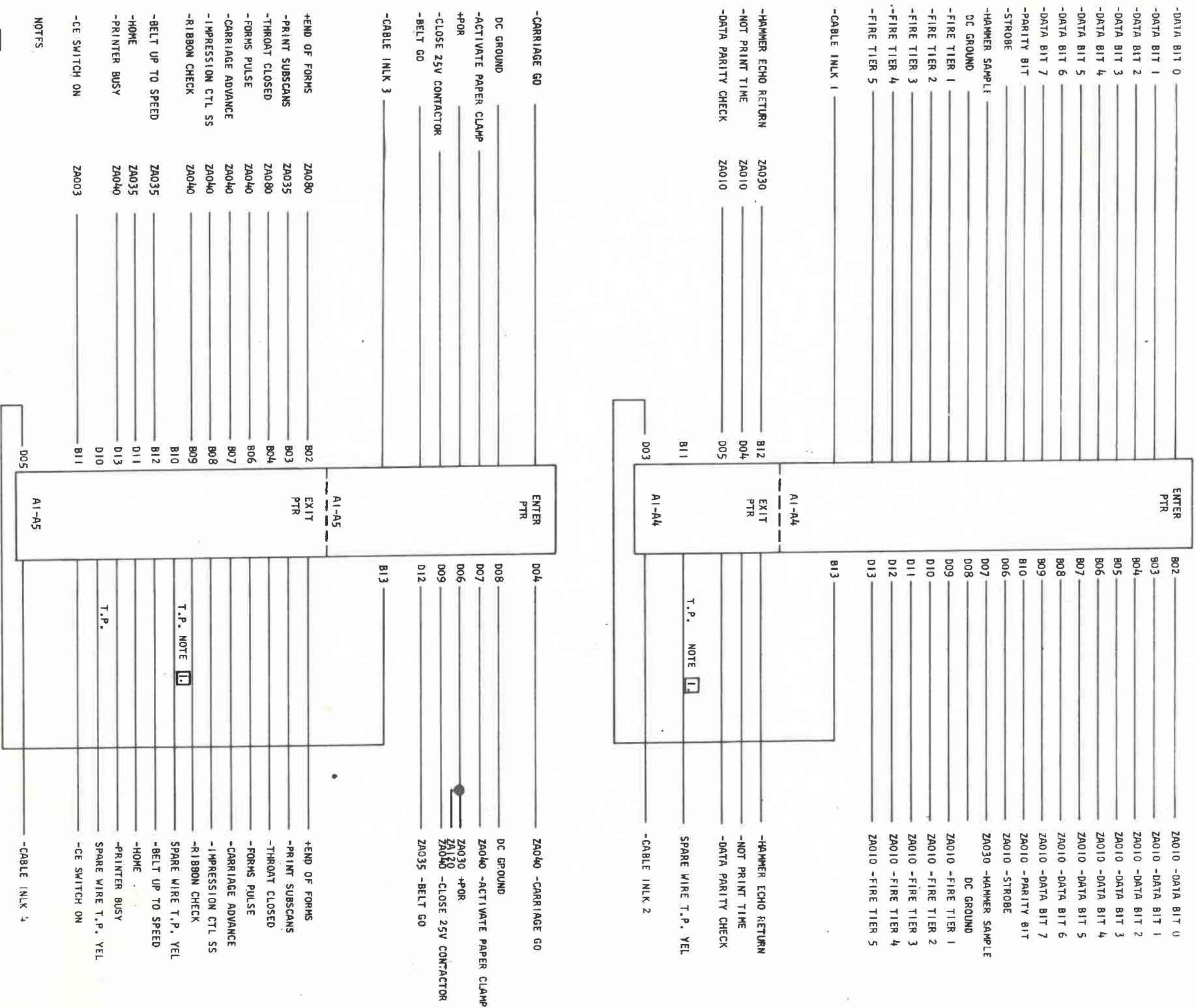
<u>PAGE</u>	<u>PART NUMBER</u>	<u>TITLE</u>	<u>PAGE</u>	<u>PART NUMBER</u>	<u>TITLE</u>
WK010	4703182	INTF PAGE	ZA120	4703201	Echo Check - Hammers 1 to 66
WK020	4703183	INTF PAGE	ZZ010	4703229	Component FRU Listing
YF001 OR YF001 OR YF001 OR YF001	4703209	60 Hz Power/Level 2 Power Supply	ZZ011	4703230	Component FRU Listing
	4703210	50 Hz Power/Level 2 Power Supply	ZZ012	6808502	Component FRU Listing (Level 2 Power Only)
	8330327	50/60 Hz Power/Level 3 Power Supply	ZZ020	4703205	Logic Gate - TB1
	8330326	50 Hz Power / Level 3 Power Supply	ZZ021	4703206	Gate Voltage Distribution
	5593471	Power Supply/Level 3 Power Supply	ZZ025	4703207	Card Location Chart
	5593490	Power Supply Control Board			
ZA002	4703184	Operator Panel Lights and Switches	Note: Logic Board Wiring-ZA010 5211-Model 1 — H2B12 to H2D08 (Gnd.)		
ZA003	4703185	CE Switches			
ZA010	4703186	Hammer Latch and Hammer Driver (1 to 66)			
ZA030	4703189	Amplifier Card (A1D4)			
ZA035	4703190	Belt Control Card (A1N2)			
ZA040	4703191	Ribbon and Carriage Control Card (A1P2)			
ZA065	4703192	Motor Driver Card (A1Q2)			
ZA070	4703193	Carriage Motor-Right Ribbon Motor			
ZA071	4703194	Belt Motor-Left Ribbon Motor			
ZA080	4703195	Switches-Throat and End-of-Forms			
ZA081	4703196	Lower Paper Clamp and Paper Hole Sense			
ZA082	4703197	Belt and Carriage Emitter			
ZA100	4703198	Hammer Coil Chart - Positions 1 to 66			

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EC 784034 01Mar78	2 of 2	
EC 784068 31July78		



INTERFACE PAGE



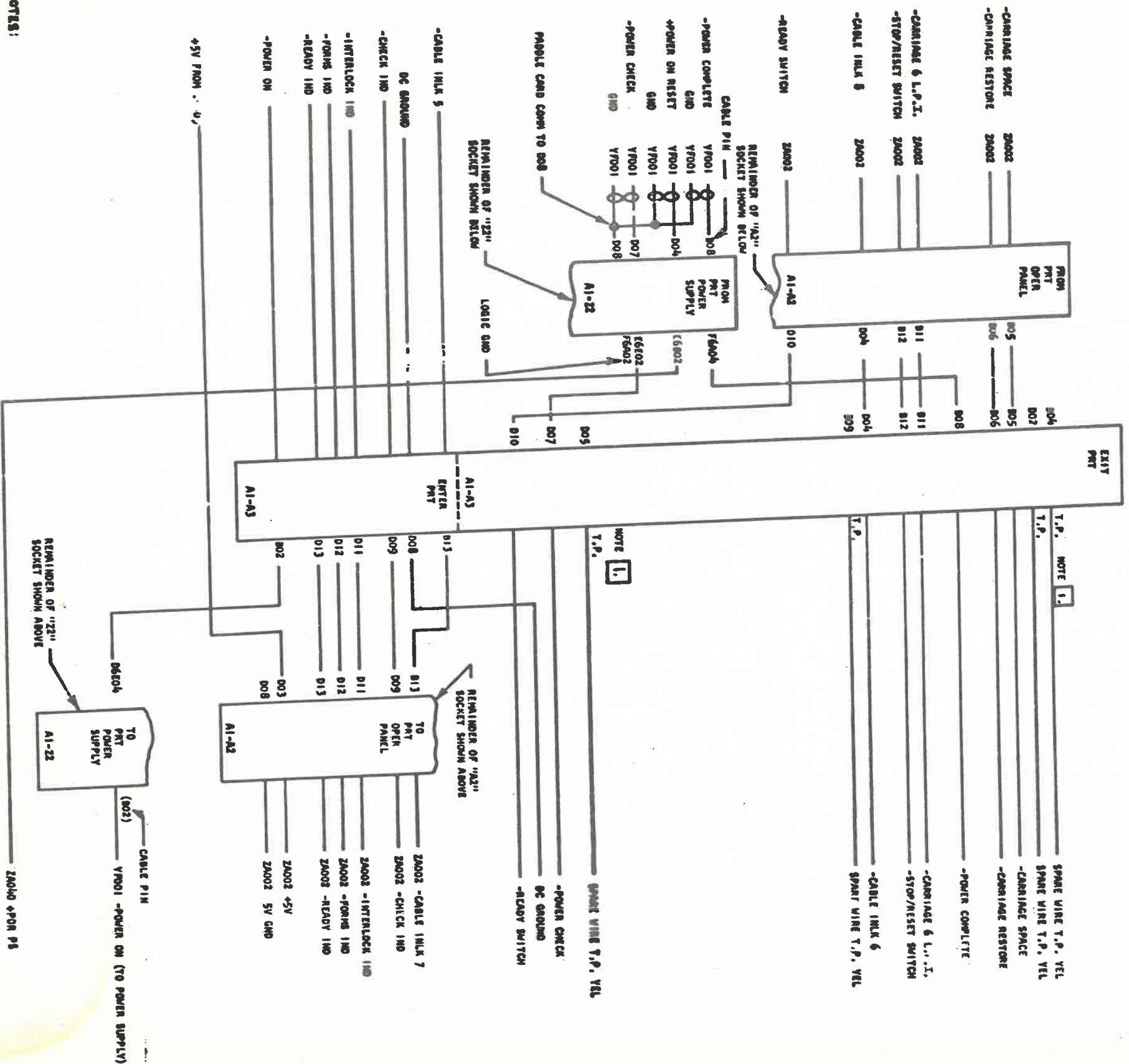
"THIS DOCUMENT IS THE PROPERTY OF IBM. ITS USE IS AUTHORIZED ONLY FOR RESPONDING TO A REQUEST FOR QUOTATION OR FOR THE PERFORMANCE OF WORK FOR IBM. ALL QUESTIONS MUST BE REFERRED TO THE IBM PURCHASING DEPARTMENT."

IBM											
NAME		INTERFACE PAGE									
DESIGN			SHT OF								
DETAIL	L.A.I	4FEB77	VD FEB77								
CHECK	G.D.B.	7FEB77	CLASSIFICATION	MUST CONFORM TO ENG SPEC	DEVELOPMENT NO		LOGIC PG NO				
APPRO	R.C.H.	9FEB77	R.C.H.	28FEB77			WK 11				





**INTERFACE PAGE**

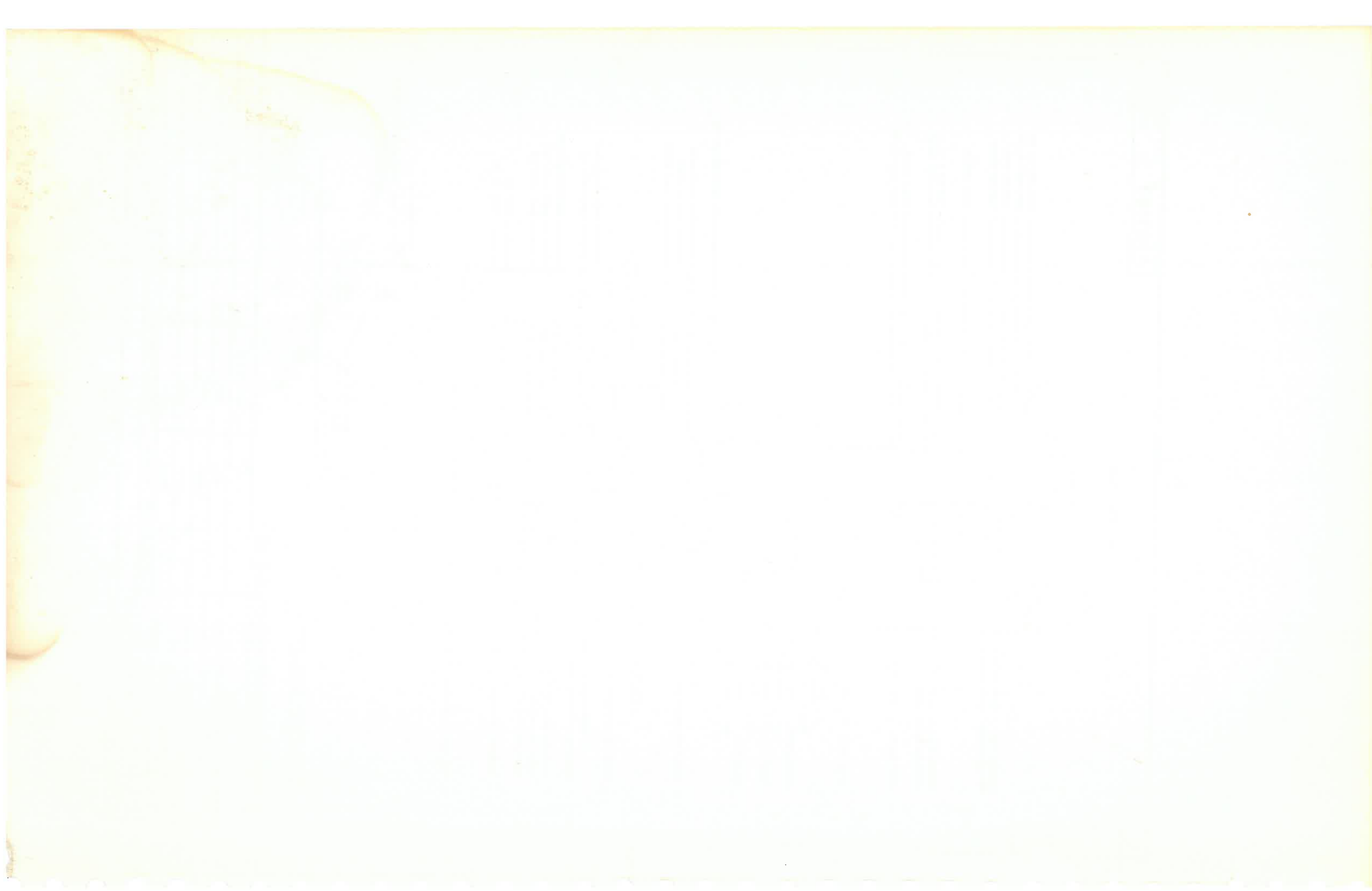


## NOTES:

1. T.P. INDICATES A TWISTED PAIR WIRE. THE BLACK WIRE TIED TO DC AND.

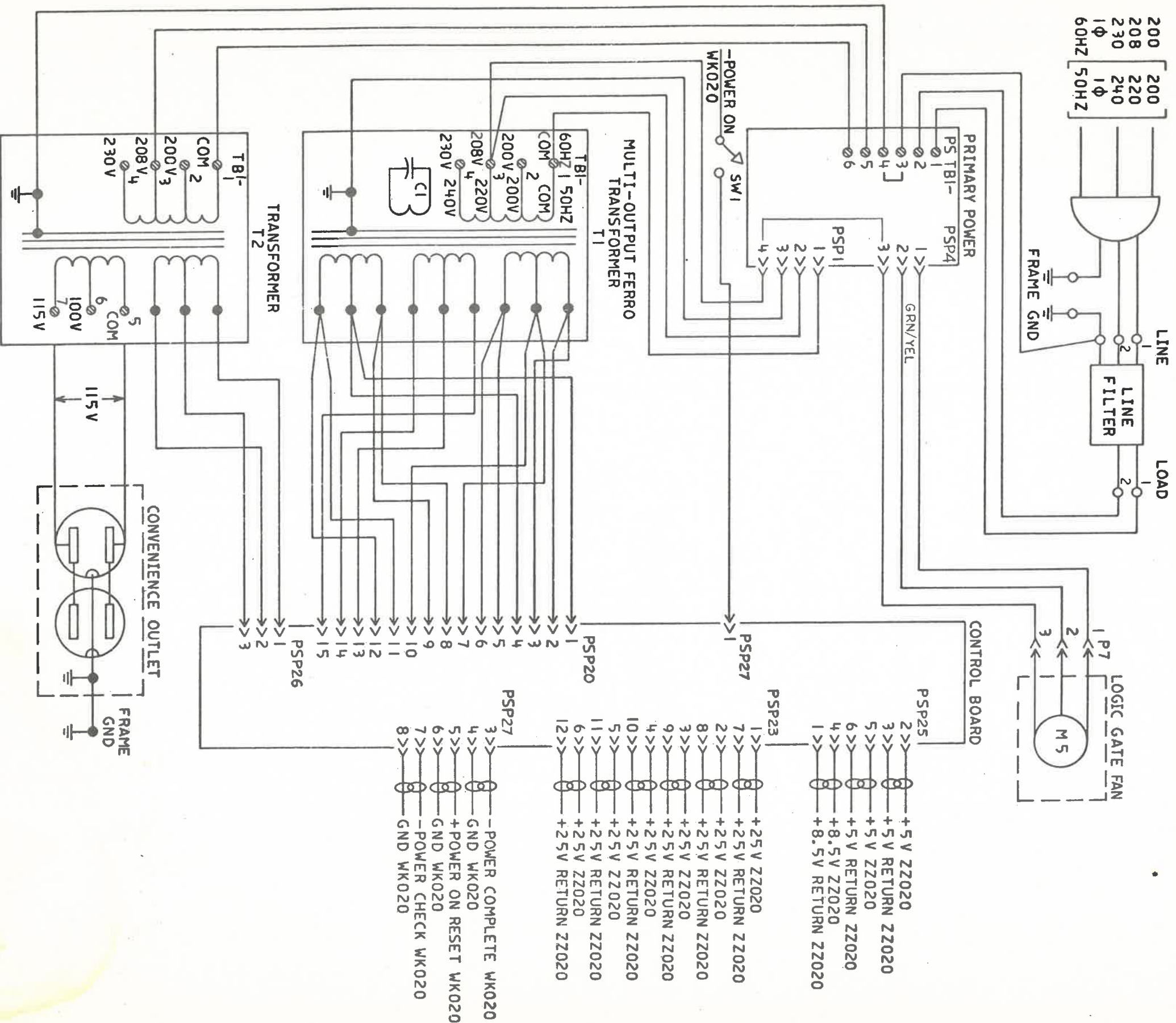
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IBM				DATE	CHANGE NO	DATE	CHANGE NO
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				6 DEC 77	356703		
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DETAIL	L.A.I.	4 JAN 77	VD FEB 77				
CHECK	G.D.B.	7 FEB 77	CLAMIFICATION				
APPRO	R.C.H.	9 FEB 77	R.C.H.	28 FEB 77			
MUST CONFORM TO ENG SPEC				DEVELOPMENT NO		LOGIC PG NO	
						WK020	





## 50/60HZ PRIMARY INPUT AND CONVENIENCE OUTLET WITH STEP DOWN TRANSFORMER



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IBM

NAME	DATE	CHANGE NO	DATE	CHANGE NO
DESIGN GB	IDECE77	SHT	17 JAN 78	155969A
DETAIL GB	IDECE77	VD NOV 77		
CHECK LAI	IDECE77	CLASSIFICATION		
APPRO JDT	PFF77			
		MUST CONFORM TO ENG SPEC		
		DEVELOPMENT NO		
		LOGIC PG NO		
		YF001		

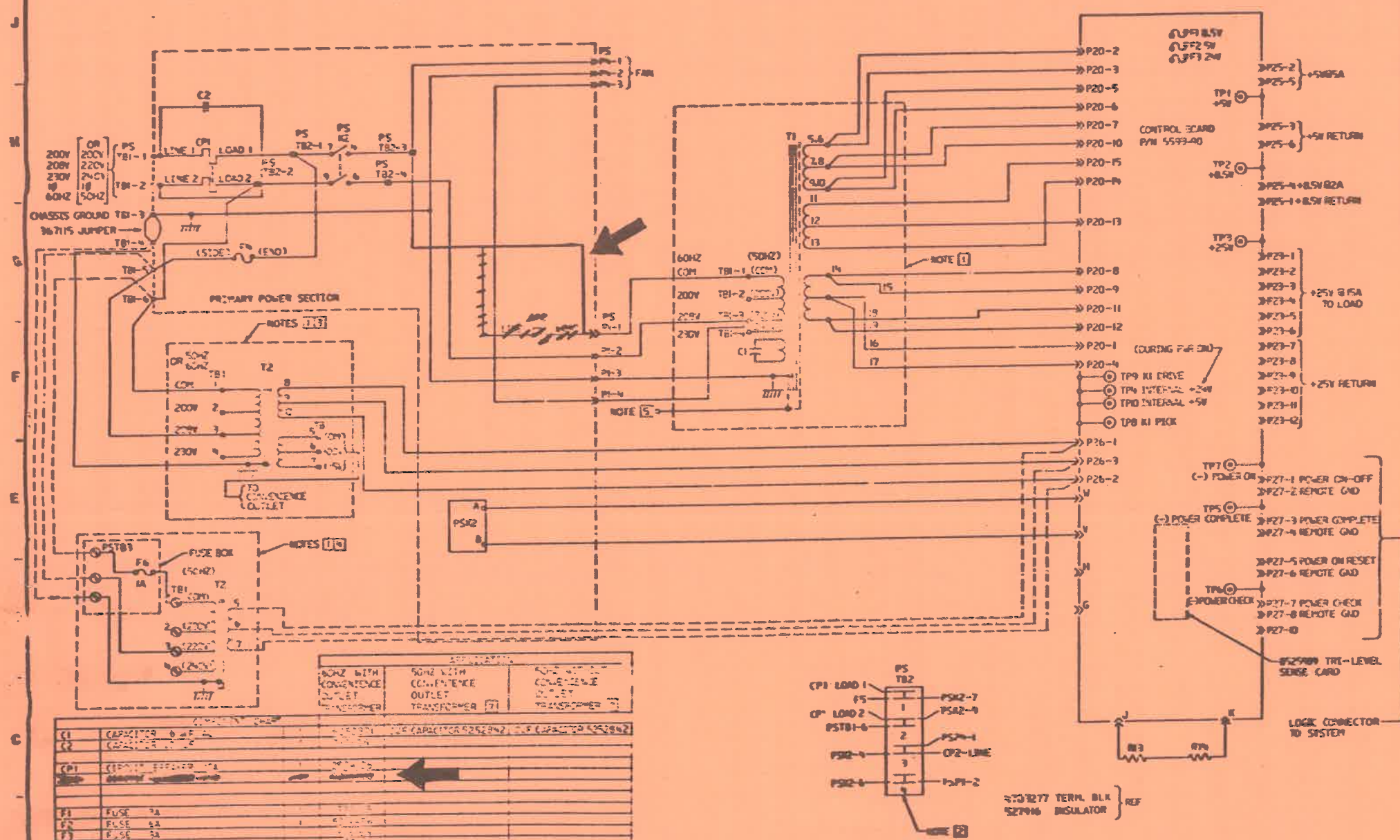




Part No	5593471
Development No	Q40
Rev	1
CC No	751303
Date	1 JUL 77
Technical Approval	155455
Electrical	794058

REFERENCE DRAWING  
REA 01-39985

- NOTES
- REFERENCE, LOCATED SEPARATE FROM POWER SUPPLY ASSEMBLY
  - LOCATED IN PRIMARY POWER SECTION
  - FOR ALL 60HZ AND 50HZ APPLICATIONS THAT ARE 100-115V CONVENIENCE OUTLET POWER, USE TRANSFORMER ASSEMBLY PART NUMBER 65593471
  - FOR ALL OTHER 50HZ APPLICATIONS, USE TRANSFORMER ASSEMBLY PART NUMBER 65593471 WHICH HAS NO 100-115V AL FOR CONVENIENCE OUTLET POWER
  - FOR 50HZ TRANSFORMER PART NUMBER 65593471 ONLY, CONNECT TO MACHINE FRAME GROUND NEAR INPUT POWER CABLE GROUND
  - VOLTAGE LEVELS IN PARENTHESES ARE FOR 50HZ APPLICATIONS ONLY
  - ONLY THE COMPONENTS THAT ARE DIFFERENT ARE SHOWN

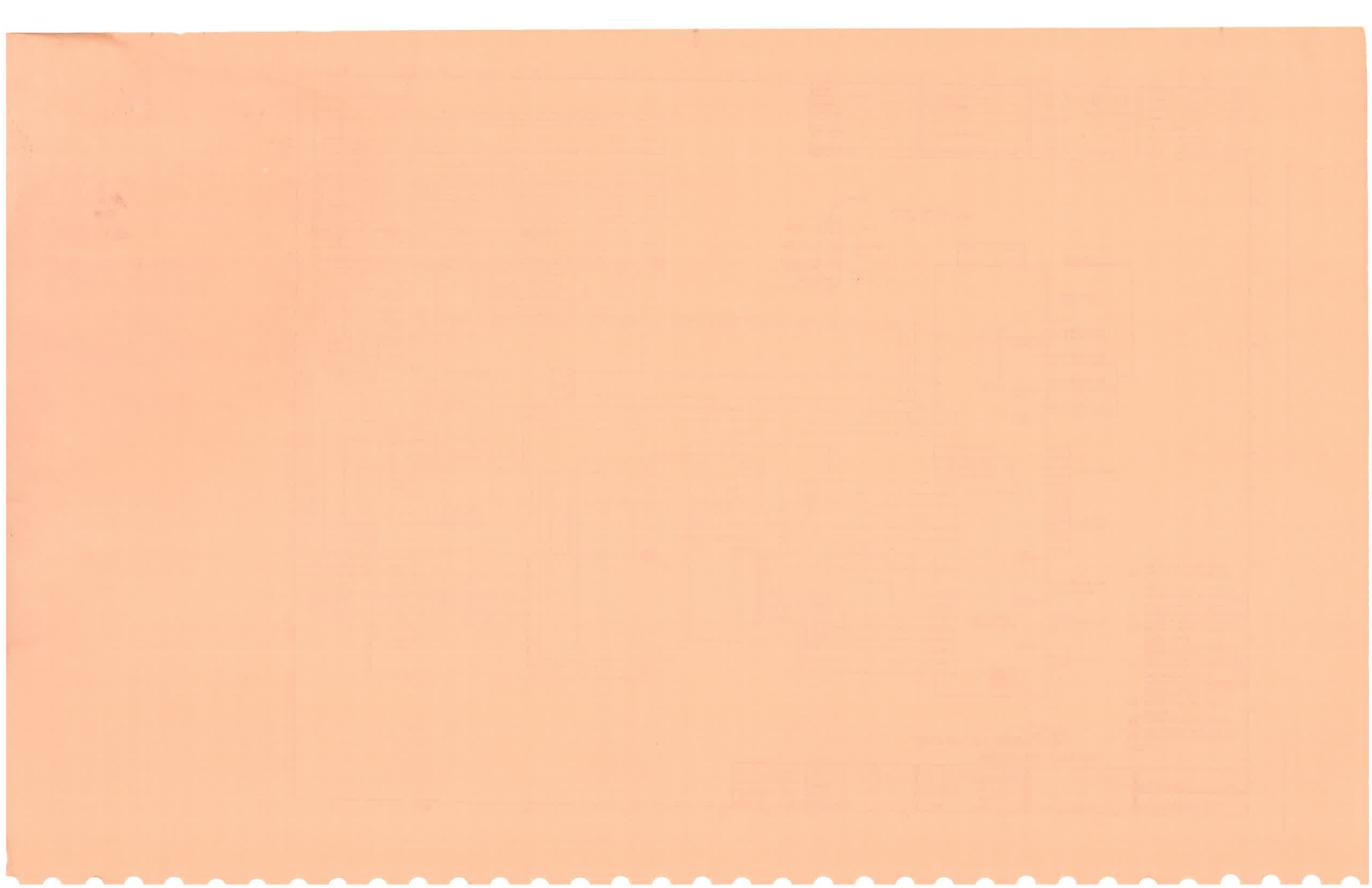


COMPONENT	VALUE	UNIT	REMARKS
C1	0.001	μF	50V
C2	0.001	μF	50V
CP1	0.001	μF	50V
F1	1A		250V
F2	1A		250V
F3	1A		250V
F4	1A		250V
F5	1A		250V
F6	1A		250V
PS1	1A		250V
PS2	1A		250V
PS3	1A		250V
PS4	1A		250V
PS5	1A		250V
PS6	1A		250V
PS7	1A		250V
PS8	1A		250V
PS9	1A		250V
PS10	1A		250V
PS11	1A		250V
PS12	1A		250V
PS13	1A		250V
PS14	1A		250V
PS15	1A		250V
PS16	1A		250V
PS17	1A		250V
PS18	1A		250V
PS19	1A		250V
PS20	1A		250V

Scale	1:1
Third Angle Projection	Yes
Design	JCH
Check	RED
Approved	JLD
Date	15 JAN 77

5593471

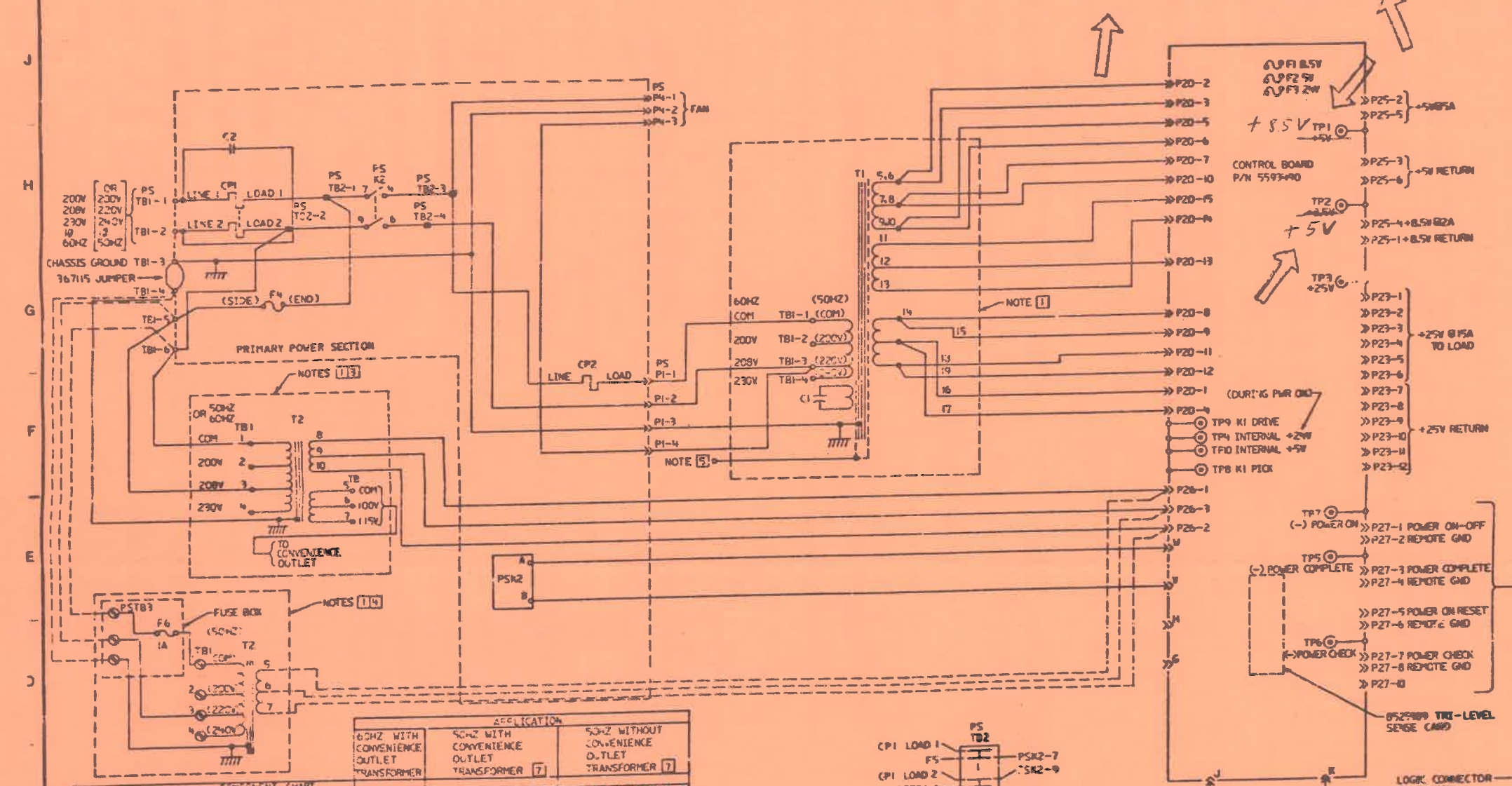




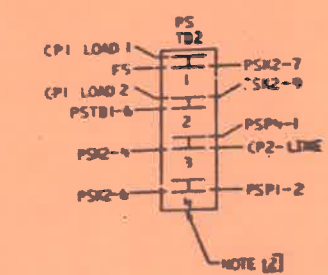
Part No. 5593470	Qty 1	Technical Approval	Date 1 JUL 77	EC No 751158	Date 1 FEB 78	EC No 155985	Part No. 5593471
Development No.			Q/M				

REFERENCE DRAWING  
 REA 91-04696 PICK-UP EC 784027

- NOTES
- REFERENCE, LOCATED SEPARATE FROM POWER SUPPLY ASSEMBLY
  - LOCATED IN PRIMARY POWER SECTION
  - FOR ALL 60HZ AND 50HZ APPLICATIONS THAT REQUIRE 100-115V CONVENIENCE OUTLET POWER, USE TRANSFORMER ASSEMBLY PART NUMBER 6808518
  - FOR ALL OTHER 50HZ APPLICATIONS, USE TRANSFORMER ASSEMBLY PART NUMBER 6808519 WHICH HAS NO 100-115V AC FOR CONVENIENCE OUTLET POWER
  - FOR 50HZ TRANSFORMER PART NUMBER 4119618 ONLY, CONNECT TO MACHINE FRAME GROUND NEAR INPUT POWER CABLE GROUND
  - VOLTAGE LEVELS IN PARENTHESES ARE FOR 50HZ APPLICATIONS ONLY
  - ONLY THE COMPONENTS THAT ARE DIFFERENT ARE SHOWN



COMPONENT CHART			
APPLICATION			
	60HZ WITH CONVENIENCE OUTLET TRANSFORMER	50HZ WITH CONVENIENCE OUTLET TRANSFORMER [7]	50HZ WITHOUT CONVENIENCE OUTLET TRANSFORMER [7]
C1	CAPACITOR 0.1 F AC	525287	525284
C2	CAPACITOR 0.1 F	732825	525284
CP1	CIRCUIT BREAKER 2A	2574 25	
CP2	CIRCUIT BREAKER 5A	5214 20	
F1	FUSE 3A	525184	
F2	FUSE 6A	52 4456	
F3	FUSE 3A	52 4456	
F4	FUSE 6A	10 680	
F6	FUSE 1A (REFERENCE ONLY)		252541
PS#2	RELAY	224232	
PS#1	RESISTOR 15.0 50W	2722128	
PS#2	RESISTOR 15.0 50W	2722128	
PS#3	RESISTOR 15.0 50W	2722128	
PS#4	RESISTOR 15.0 50W	2722128	
PS#5	RESISTOR 15.0 50W	2722128	
PS#6	RESISTOR 15.0 50W	2722128	
PS#7	RESISTOR 15.0 50W	2722128	
PS#8	RESISTOR 15.0 50W	2722128	
PS#9	RESISTOR 15.0 50W	2722128	
PS#10	RESISTOR 15.0 50W	2722128	
PS#11	RESISTOR 15.0 50W	2722128	
PS#12	RESISTOR 15.0 50W	2722128	
PS#13	RESISTOR 15.0 50W	2722128	
PS#14	RESISTOR 15.0 50W	2722128	
PS#15	RESISTOR 15.0 50W	2722128	
PS#16	RESISTOR 15.0 50W	2722128	
PS#17	RESISTOR 15.0 50W	2722128	
PS#18	RESISTOR 15.0 50W	2722128	
PS#19	RESISTOR 15.0 50W	2722128	
PS#20	RESISTOR 15.0 50W	2722128	
PS#21	RESISTOR 15.0 50W	2722128	
PS#22	RESISTOR 15.0 50W	2722128	
PS#23	RESISTOR 15.0 50W	2722128	
PS#24	RESISTOR 15.0 50W	2722128	
PS#25	RESISTOR 15.0 50W	2722128	
PS#26	RESISTOR 15.0 50W	2722128	
PS#27	RESISTOR 15.0 50W	2722128	
PS#28	RESISTOR 15.0 50W	2722128	
PS#29	RESISTOR 15.0 50W	2722128	
PS#30	RESISTOR 15.0 50W	2722128	



Part No. 5593470	Qty 1	Technical Approval	Date 1 JUL 77	EC No 751158	Date 1 FEB 78	EC No 155985	Part No. 5593471
Development No.			Q/M				

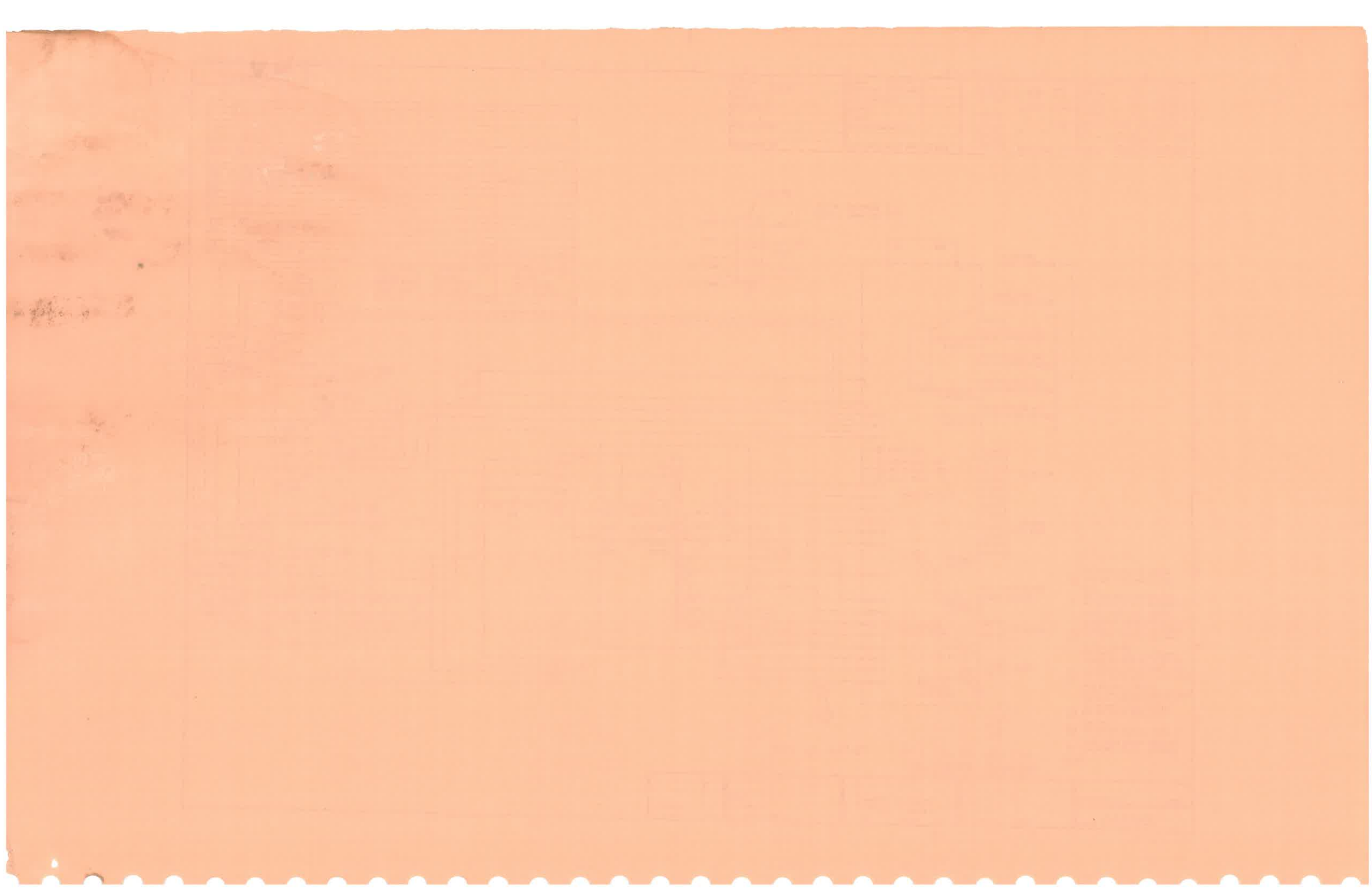
  

Major Customer to Eng Spec 2749999	Scale NONE	IBM
Tolerances Unless Noted	0 25 100	WIRING DIAGRAM (50HZ)
Unit: mm	Third Angle Projection	Designer JCH 15 JAN 77
Check: RED 15 JAN 77	Approved JLD 15 JAN 77	Checked JLD 15 JAN 77
Configuration JLD 15 JAN 77		

5593471

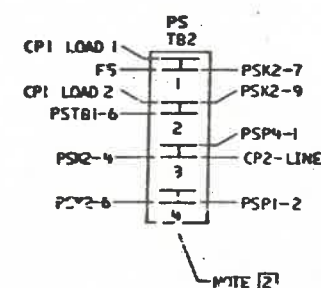
YF005

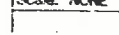
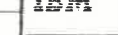
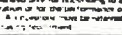








REFERENCE DRAWING

- 1 REFERENCE. LOCATED SEPARATE FROM POWER SUPPLY ASSEMBLY
- 2 LOCATED IN PRIMARY POWER SECTION
- 3 FOR ALL 60HZ AND 50HZ APPLICATIONS THAT REQUIRE 100-115V CONVENIENCE OUTLET POWER. USE TRANSFORMER ASSEMBLY PART NUMBER 6808518
- 4 FOR ALL OTHER 50HZ APPLICATIONS USE TRANSFORMER ASSEMBLY PART NUMBER 6808519 WHICH HAS NO 100-115V AC FOR CONVENIENCE OUTLET POWER
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- 6 VOLTAGE LEVELS IN PARENTHESES ARE FOR 50HZ APPLICATIONS ONLY
- 7 ONLY THE COMPONENTS THAT ARE DIFFERENT ARE SHOWN



IBM Material No.	Must Conform to Eng. Spec: 2.543999							
Mkt Alternate No.	Tolerances Unless Noted							
Case Depth	Linear ±							
Hardness	Angles ±							
Surface Treatment	Radio Unless Noted							
	Edge/Corner Breaks	Outside Max						
		Inside Max						



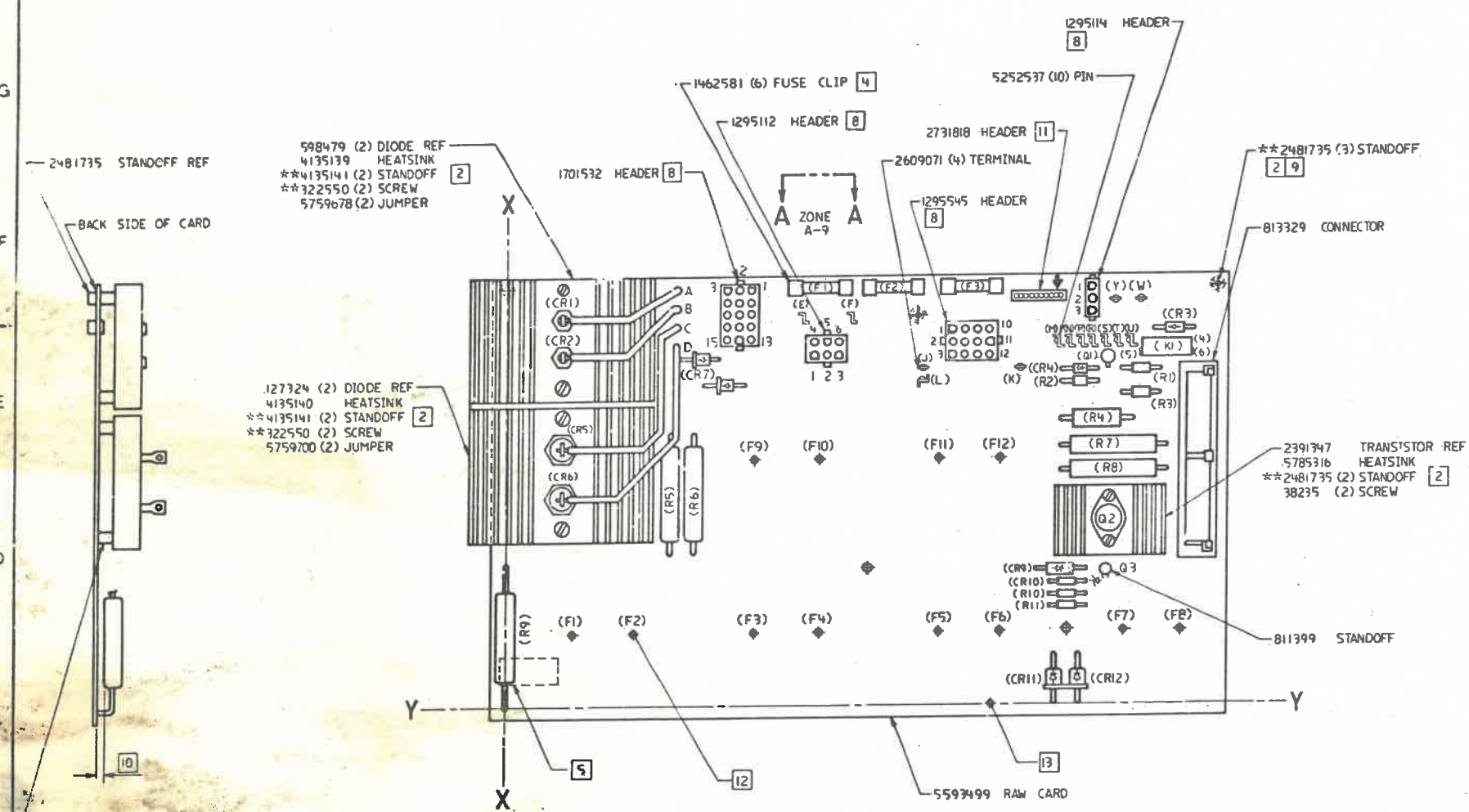


Ret for Asm 5593470		Qty 1	Technical Approval Electrical Material		Date 1 JUL 77 5 DEC 77 4 MAY 78	EC No 751358 751358C 784029	Date Date	EC No EC No	Part No 5593490	Development No
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1-2

NOTES

- 1 FUSE CLIP PART NUMBER 1462581 MUST BE ORIENTATED AS SHOWN
- 2 STANDOFFS MUST WITHSTAND A MINIMUM TORQUE OF 13 CM/KGF AFTER SWAGING AND SOLDERING
- 3
- 4
- 5 MARK THE FOLLOWING INFORMATION ON THE BACK SIDE OF CARD AS SHOWN WITH 1.5 HIGH NON-MAGNETIC GOTHIC PRINTING APPROXIMATELY AS SHOWN.  
ASM 5593490  
E.C.  
DATE OF ASM
- 6 COMPONENT DESIGNATIONS IN PARENTHESIS ARE FOR REFERENCE ONLY
- 7
- 8 HEADER MUST BE ORIENTATED AS SHOWN
- 9 STANDOFF TO BE INSERTED FROM BACK SIDE OF CARD ONLY. STANDOFF THREADS TO BE FREE OF ANY SOLDER
- 10 COMPONENT MUST BE 3.18 OFF SURFACE OF BOARD
- 11 HEADER MUST BE ORIENTATED SO MISSING PIN IS IN POSITION INDICATED BY ARROW
- 12 LANDS AROUND HOLES F1-F12 TO BE FREE OF ANY SOLDER WITHIN 4 OF EDGE OF HOLE
- 13 THIS HOLE FOR MANUFACTURING PURPOSES ONLY



ELECTRICAL COMPONENT CHART			
COMPONENT	DESCRIPTION	QUANTITY	PART NUMBER
R1	RES 2 K $\Omega$ .5 W	1	317019
R2	RES 47 $\Omega$ .5 W	1	216421
R3	RES 4.3 K $\Omega$ .5 W	1	317023
R4	RES 330 $\Omega$ .5 W	1	207325
R5, R6	RES 10 $\Omega$ 10 W	2	556485
R7	RES 36 $\Omega$ 10 W	1	2396721
R8	RES 250 $\Omega$ 10 W	1	2102363
R9	RES 30 $\Omega$ 10 W	1	2154981
R10	RES 620 $\Omega$ .5 W	1	317013
R11	RES 300 $\Omega$ .5 W	1	317008
CR1, CR2	DIODE 10 A	2	598479
CR3, CR4	DIODE (AM)	2	2111292
CR5, CR6	DIODE 30 A	2	127324
CR7, CR8, CR11, CR12	DIODE 3 A	4	5252534
CR9	DIODE (GI)	1	2414810
CR10	DIODE (BLS)	1	492496
F1, F3	FUSE 3A 125 V	2	338165
F2	FUSE 6A 250V	1	5214456
K1	RELAY	1	5252649
Q1	TRANSISTOR 297	1	2396887
Q2	TRANSISTOR 359	1	2391347
Q3	TRANSISTOR 194	1	2414818

\*\* DENOTES MULTIPLE USAGE

IBM Material No B90913	Must Conform to Eng Spec 23-3999
Matl Alternate No	Tolerances Unless Noted
Case Depth	Linear $\pm$
Hardness	Angles $\pm$
Surface Treatment	Radius Unless Noted
Code No	Edge/Corner Outside Max Breaks Inside Max

Scale 1/1	Third Angle Projection
metric	AO

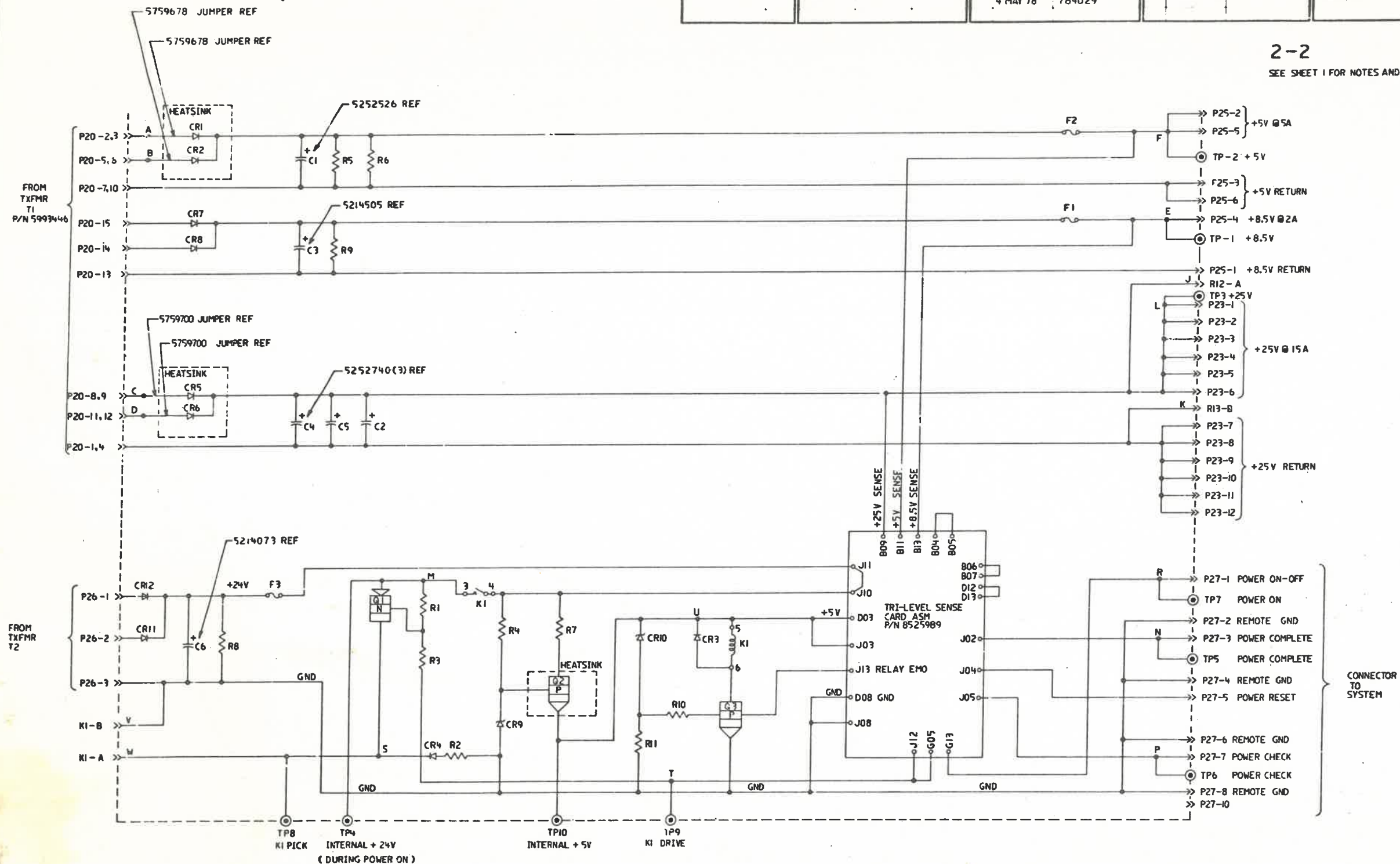
Title CARD ASSEMBLY -	
Designer	RED 26 JAN 77
Checked	PS 26 JAN 77
Approved	26 JAN 77





Rel for Asm 5593470	Qty 1	Technical Approval Electrical Material	Date 1 JUL 77 5 DEC 77 4 MAY 78	EC No 751 35 8 751358C 784029	Date EC No	Part No 5593490	Development No C/M
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2-2  
SEE SHEET 1 FOR NOTES AND CHART



YF007

2-2

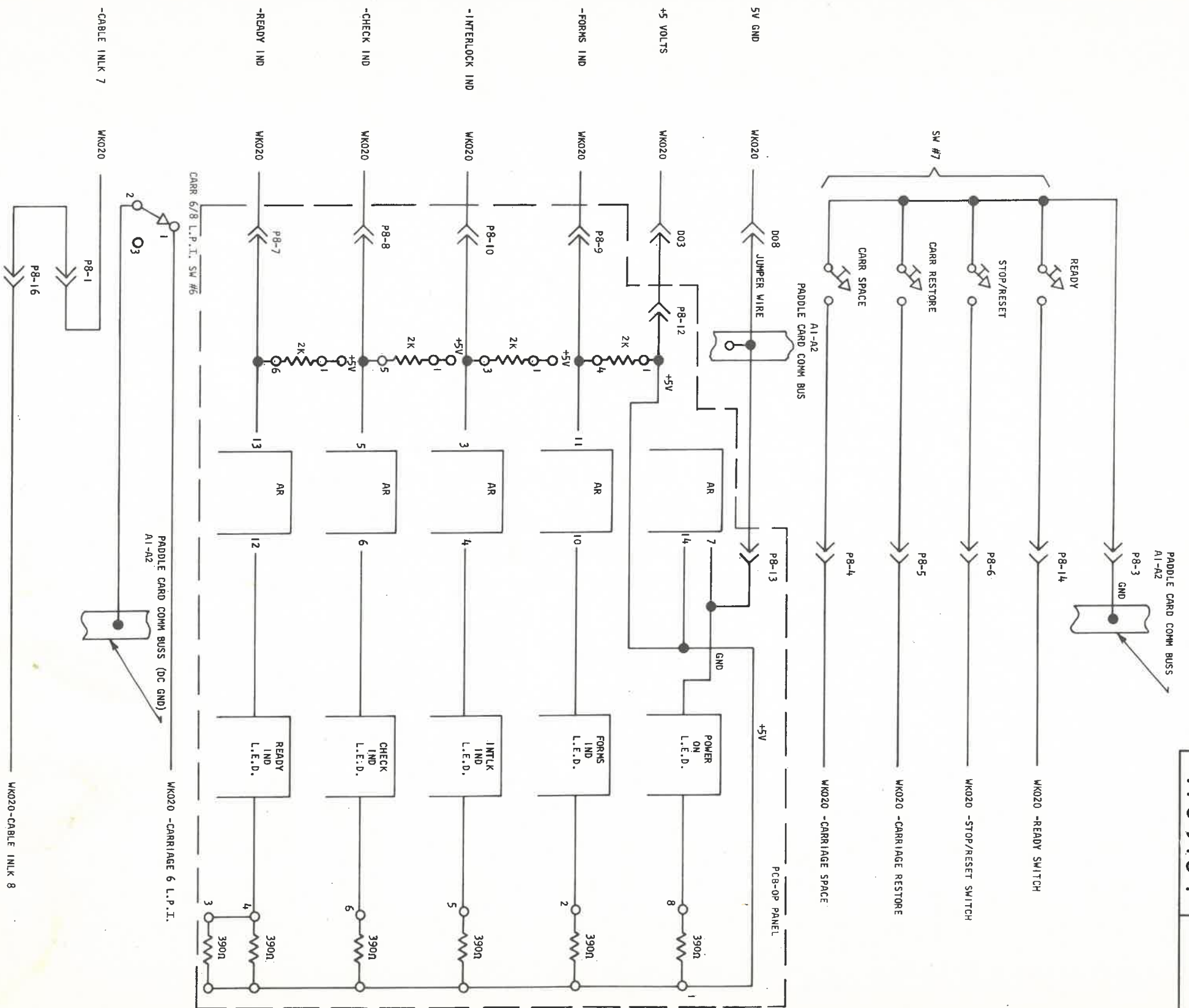
5593490

IBM Material No. 890913	Must Conform to Eng Spec: 2343999	Scale: 1/1		
Matt Alternate No.	Tolerances Unless Noted	0 25 mm		
Case Depth	Linear ±			
Hardness	Angles ±			
Surface Treatment	Radius Unless Noted			
Code No	Edge/Corner Outside Max			
	Breaks Inside Max			

WIRE DIAGRAM	
For CONTROL BOARD	
Designer	JCM 26 JAN 77
Checked	RED 26 JAN 77
Approved	JLD 26 JAN 77
Class/Date	







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IBM		DATE	CHANGE NO	DATE	CHANGE NO
NAME OPER PANEL SWITCHES AND LIGHTS		24 JAN 77	1495290		
DESIGN	SHT OF	10 AUG 77	359424		
DETAIL	VD FEB 77	60 EC 77	356703		
CHECK	G.D.B. 7 FEB 77				
APPROV	F.T.H. 9 FEB 77	R.C.H. 28 FEB 77			
		MUST CONFORM TO ENG SPEC		DEVELOPMENT NO	LOGIC PG NO
					ZA002

4703184

C



C

4703187

MOD II

PART NO  
4703187

LOGIC PG NO  
ZA010

W010 -DATA BIT 0  
W010 -DATA BIT 1  
W010 -DATA BIT 2  
W010 -DATA BIT 3  
W010 -DATA BIT 4  
W010 -DATA BIT 5  
W010 -DATA BIT 6  
W010 -DATA BIT 7  
W010 -STROBE  
W010 -PARITY BIT  
W010 -FIRE TIER 1  
W010 -FIRE TIER 2  
W010 -FIRE TIER 3  
W010 -FIRE TIER 4  
W010 -FIRE TIER 5  
Z030 -FIRE  
Z035 -PRINT SUB SCAN

NOTE 1. \_\_\_\_\_ 012

CONTINUED ON ZA020

A1-02

B03  
B10  
011

W010 -NOT PRINT TIME  
ZA120, ZA040 -NOT PRINT TIME CHECK  
W010 -DATA PARITY CHECK

TOP CARD CONNECTOR			
W010 LATCH CARD		W010 CARD	
V13	-FIRE 2	V13	002
V12	-FIRE 4	V12	003
V11	-FIRE 8	V11	004
V10	-FIRE 16	V10	005
V09	-FIRE 32	V09	006
V08	-FIRE 64	V08	007
V07	-FIRE 128	V07	008
V06	-FIRE 256	V06	009
V05	-FIRE 512	V05	010
V04	-FIRE 1024	V04	011
V03	-FIRE 2048	V03	012
V02	-FIRE 4096	V02	013
V01	-FIRE 8192	V01	014
X13	-FIRE 48	X13	015
X12	-FIRE 96	X12	016
X11	-FIRE 192	X11	017
X10	-FIRE 384	X10	018
X09	-FIRE 768	X09	019
X08	-FIRE 1536	X08	020
X07	-FIRE 3072	X07	021
X06	-FIRE 6144	X06	022
X05	-FIRE 12288	X05	023
X04	-FIRE 24576	X04	024
X03	-FIRE 49152	X03	025
X02	-FIRE 98304	X02	026
X01	-FIRE 196608	X01	027
Y13	-FIRE 96	Y13	028
Y12	-FIRE 192	Y12	029
Y11	-FIRE 384	Y11	030
Y10	-FIRE 768	Y10	031
Y09	-FIRE 1536	Y09	032
Y08	-FIRE 3072	Y08	033
Y07	-FIRE 6144	Y07	034
Y06	-FIRE 12288	Y06	035
Y05	-FIRE 24576	Y05	036
Y04	-FIRE 49152	Y04	037
Y03	-FIRE 98304	Y03	038
Y02	-FIRE 196608	Y02	039
Y01	-FIRE 393216	Y01	040
Z01	-FIRE 786432	Z01	041
Z02	-FIRE 1572864	Z02	042
Z03	-FIRE 3145728	Z03	043
Z04	-FIRE 6291456	Z04	044
Z05	-FIRE 12582912	Z05	045
Z06	-FIRE 25165824	Z06	046
Z07	-FIRE 50331648	Z07	047
Z08	-FIRE 100663296	Z08	048
Z09	-FIRE 201326592	Z09	049
Z10	-FIRE 402653184	Z10	050
Z11	-FIRE 805306368	Z11	051
Z12	-FIRE 1610612736	Z12	052
Z13	-FIRE 3221225472	Z13	053
Z14	-FIRE 6442450944	Z14	054
Z15	-FIRE 12884901888	Z15	055
Z16	-FIRE 25769803776	Z16	056
Z17	-FIRE 51539607552	Z17	057
Z18	-FIRE 103079215104	Z18	058
Z19	-FIRE 206158430208	Z19	059
Z20	-FIRE 412316860416	Z20	060
Z21	-FIRE 824633720832	Z21	061
Z22	-FIRE 1649267441664	Z22	062
Z23	-FIRE 3298534883328	Z23	063
Z24	-FIRE 6597069766656	Z24	064
Z25	-FIRE 13194139533312	Z25	065
Z26	-FIRE 26388279066624	Z26	066
Z27	-FIRE 52776558133248	Z27	067
Z28	-FIRE 105553116266496	Z28	068
Z29	-FIRE 211106232532992	Z29	069
Z30	-FIRE 422212465065984	Z30	070
Z31	-FIRE 844424930131968	Z31	071
Z32	-FIRE 1688849860263936	Z32	072
Z33	-FIRE 3377699720527872	Z33	073
Z34	-FIRE 6755399441055744	Z34	074
Z35	-FIRE 13510798882111488	Z35	075
Z36	-FIRE 27021597764222976	Z36	076
Z37	-FIRE 54043195528445952	Z37	077
Z38	-FIRE 10808639105689184	Z38	078
Z39	-FIRE 21617278211378368	Z39	079
Z40	-FIRE 43234556422756736	Z40	080
Z41	-FIRE 86469112845513472	Z41	081
Z42	-FIRE 17293822569102744	Z42	082
Z43	-FIRE 34587645138205488	Z43	083
Z44	-FIRE 69175290276410976	Z44	084
Z45	-FIRE 138350580552821952	Z45	085
Z46	-FIRE 276701161105643904	Z46	086
Z47	-FIRE 553402322211287808	Z47	087
Z48	-FIRE 1106804644222557616	Z48	088
Z49	-FIRE 2213609288445115232	Z49	089
Z50	-FIRE 4427218576890230464	Z50	090
Z51	-FIRE 8854437153780460928	Z51	091
Z52	-FIRE 17708874307560921856	Z52	092
Z53	-FIRE 35417748615121843712	Z53	093
Z54	-FIRE 70835497230243687424	Z54	094
Z55	-FIRE 141670994460487374848	Z55	095
Z56	-FIRE 283341988920974749696	Z56	096
Z57	-FIRE 566683977841949499392	Z57	097
Z58	-FIRE 1133367955683898998784	Z58	098
Z59	-FIRE 2266735911367797997568	Z59	099
Z60	-FIRE 4533471822735595995136	Z60	100
Z61	-FIRE 9066943645471191990272	Z61	101
Z62	-FIRE 18133887290943983980544	Z62	102
Z63	-FIRE 36267774581887967961088	Z63	103
Z64	-FIRE 72535549163775935922176	Z64	104
Z65	-FIRE 14507109832755187184352	Z65	105
Z66	-FIRE 29014219665510374368704	Z66	106
Z67	-FIRE 5802843933102074873728	Z67	107
Z68	-FIRE 11605687866204149464556	Z68	108
Z69	-FIRE 23211375732408298929112	Z69	109
Z70	-FIRE 46422751464816597858224	Z70	110
Z71	-FIRE 92845502929633195716448	Z71	111
Z72	-FIRE 18569100585926639152896	Z72	112
Z73	-FIRE 37138201171853278305792	Z73	113
Z74	-FIRE 74276402343706556611584	Z74	114
Z75	-FIRE 14855280467541311322368	Z75	115
Z76	-FIRE 29710560935082622644736	Z76	116
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Z82	-FIRE 1901475899844887849263104	Z82	122
Z83	-FIRE 380295179968977569852608	Z83	123
Z84	-FIRE 760590359937955139705216	Z84	124
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Z91	-FIRE 973555660003782568987568	Z91	131
Z92	-FIRE 1947111320007565377975136	Z92	132

NOTE:

1. FLOAT PIN IN B12 ON MOD II.

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FOR IBM. ALL QUESTIONS MUST BE REFERRED TO THE IBM PURCHASING DEPARTMENT.

NAME		DATE		CHANGE NO		DATE		CHANGE NO	
HWR LATCH & HWR DATA		22 JAN 77		1495290					
EVEN MOD II		10 AUG 77		359424					
DESIGN		SHT OF		356703					
DETAIL	L.A.I.	13 JAN 77	VD FEB 77						
CHECK	G.D.B.	18 JAN 77	CLASSIFICATION						
APPRO	R.C.M.	9 FEB 77	18 FEB 77						
				MUST CONFORM TO ENG SPEC		DEVELOPMENT NO		LOGIC PG NO	
								ZA010	
4703187									

980-0134-1

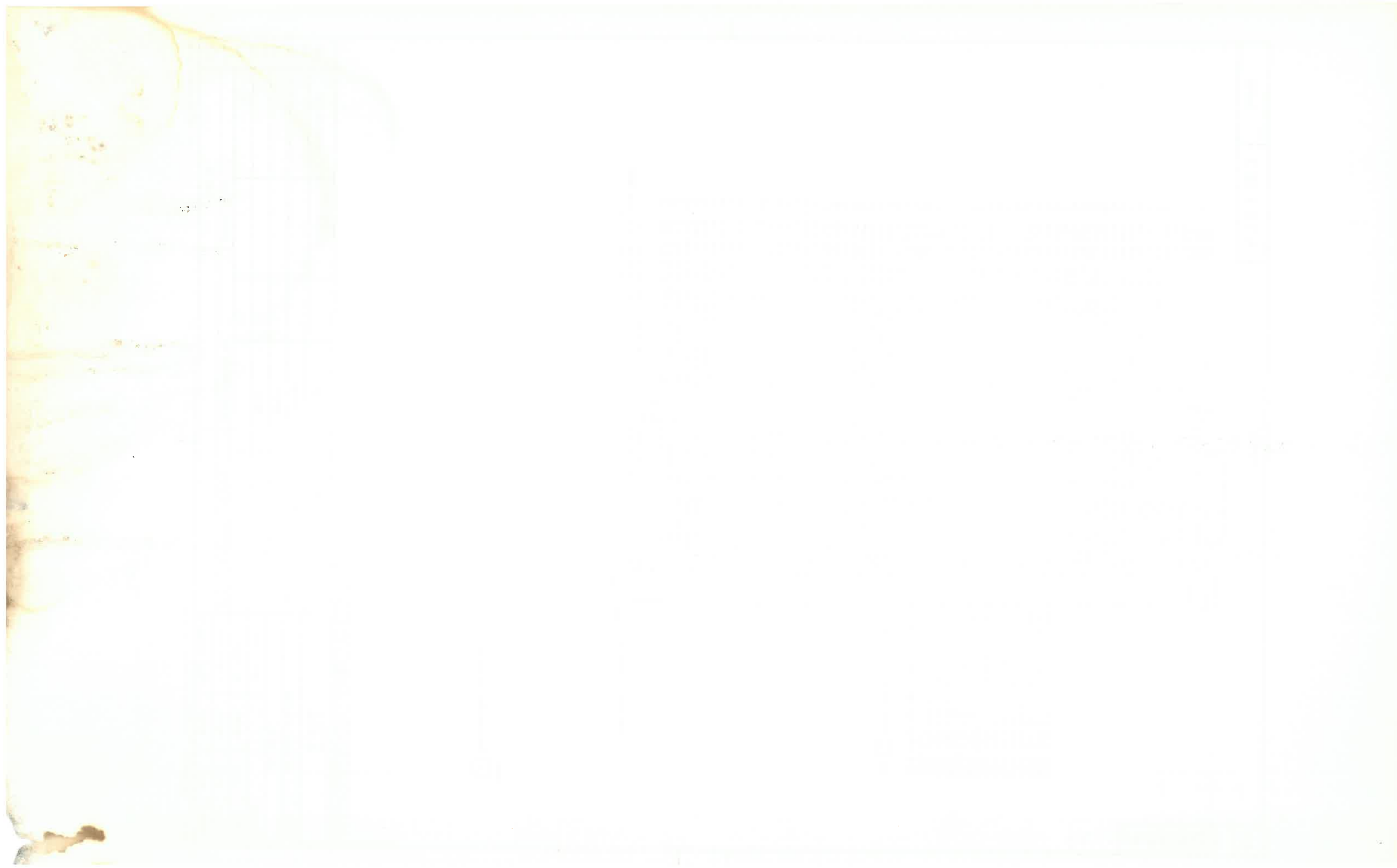
IBM 7090/7090-10

VERICAL ELECTRICAL FORMAT

ATTACHED TO ABOVE

IBM 7090/7090-10





C

4703188

MOD II

PART NO  
4703188

LOGIC PG NO  
ZA020

CONTINUED FROM ZA010

HRR  
LATCH  
CARD

G02	P13	
J02	M13	
G03	P12	
J04	M12	
G05	P11	
J05	M11	
G06	P10	
J06	M10	
G07	P09	
J07	M09	
G08	P08	
J08	M08	
G09	P07	
J09	M07	
G10	P06	
J10	M06	
G11	P05	
J11	M05	
G12	P04	
J12	M04	
G13	P03	
J13	M03	
G14	P02	
J14	M02	
G15	P01	
J15	M01	

FEED  
THRU  
CARD

TOP CARD  
CONNECTOR

V13	1	Y13
V12	5	Y12
V11	7	Y11
V10	9	Y10
V09	13	Y09
V08	15	Y08
V07	17	Y07
V06	23	Y06
V05	25	Y05
V04	27	Y04
V03	29	Y03
V02	31	Y02
V01	33	Y01
V00	35	Y00
V99	37	Y99
V98	39	Y98
V97	41	Y97
V96	43	Y96
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V89	57	Y89
V88	59	Y88
V87	61	Y87
V86	63	Y86
V85	65	Y85
V84	67	Y84
V83	69	Y83
V82	71	Y82
V81	73	Y81
V80	75	Y80
V79	77	Y79
V78	79	Y78
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V76	83	Y76
V75	85	Y75
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V17	201	Y17
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V15	205	Y15
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V11	213	Y11
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V02	231	Y02
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V86	263	Y86
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V83	269	Y83
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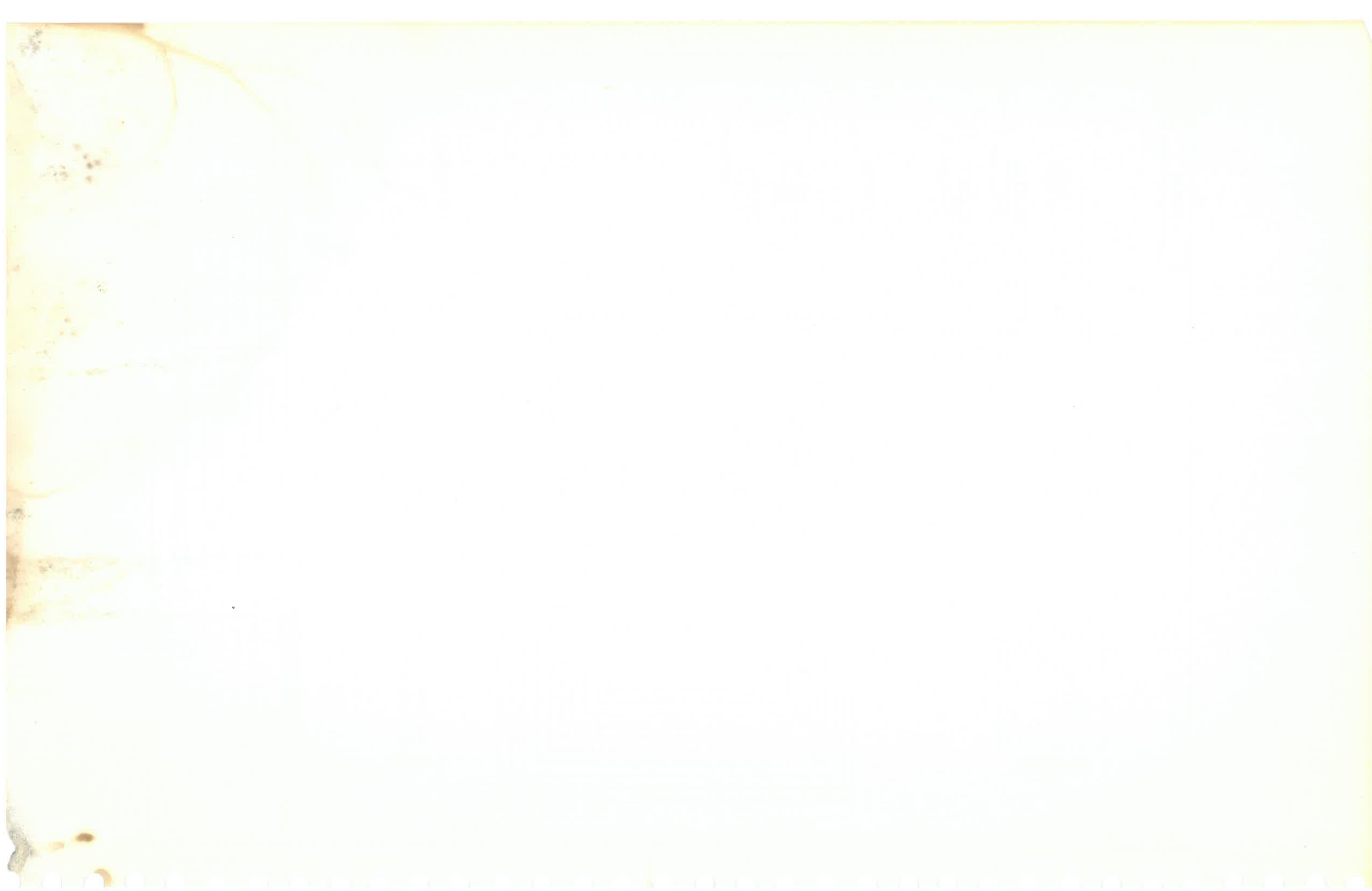












C

**LEHMAN, PETER AND**  
**ZAOLO**

ZA040



**NOTES:**

- |    |                                      |
|----|--------------------------------------|
| 1. | I/O PIN RESERVED FOR FEATURE WIRING. |
| 2. | I/O PIN USED FOR CARD TEST ONLY.     |

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4703191











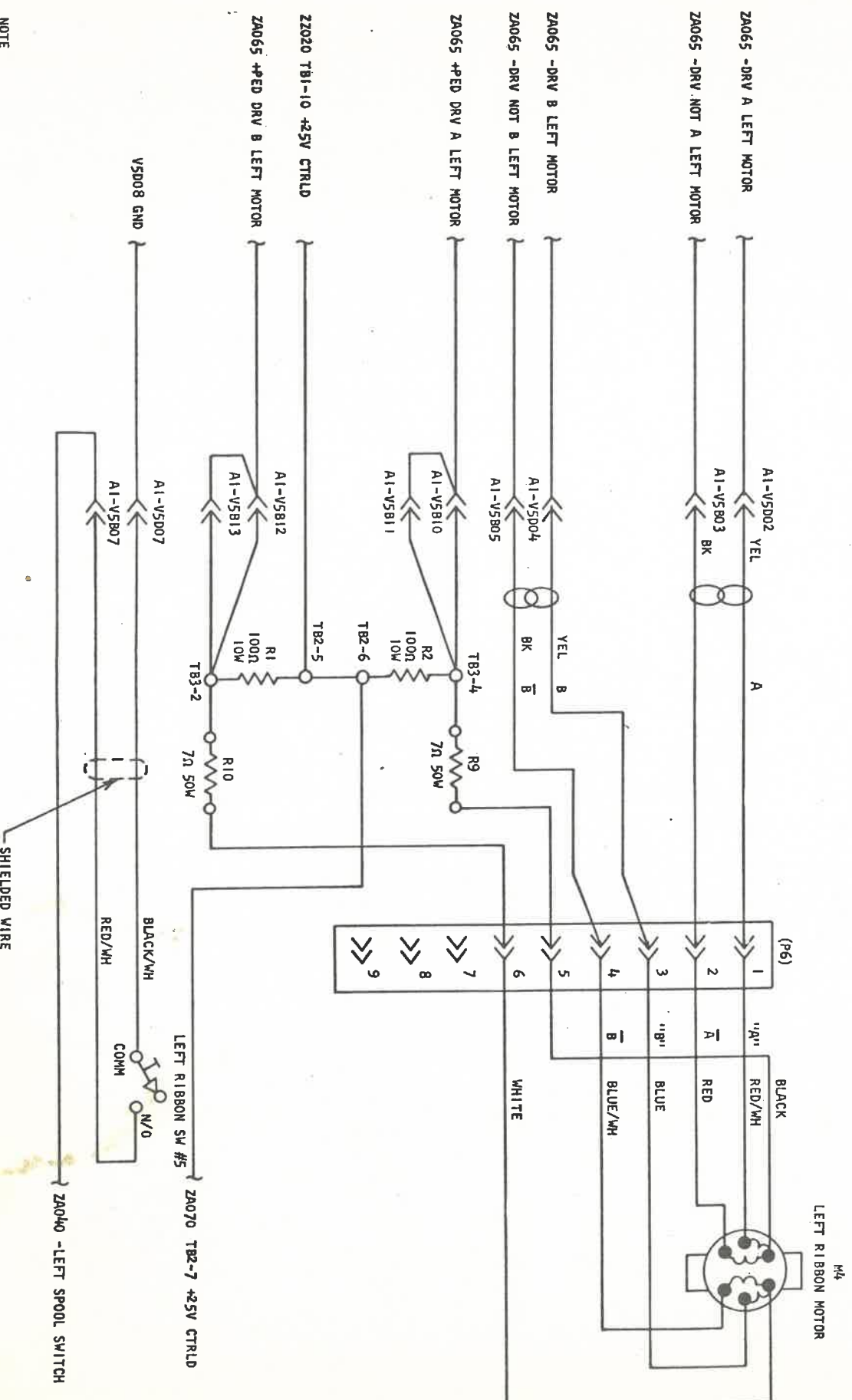
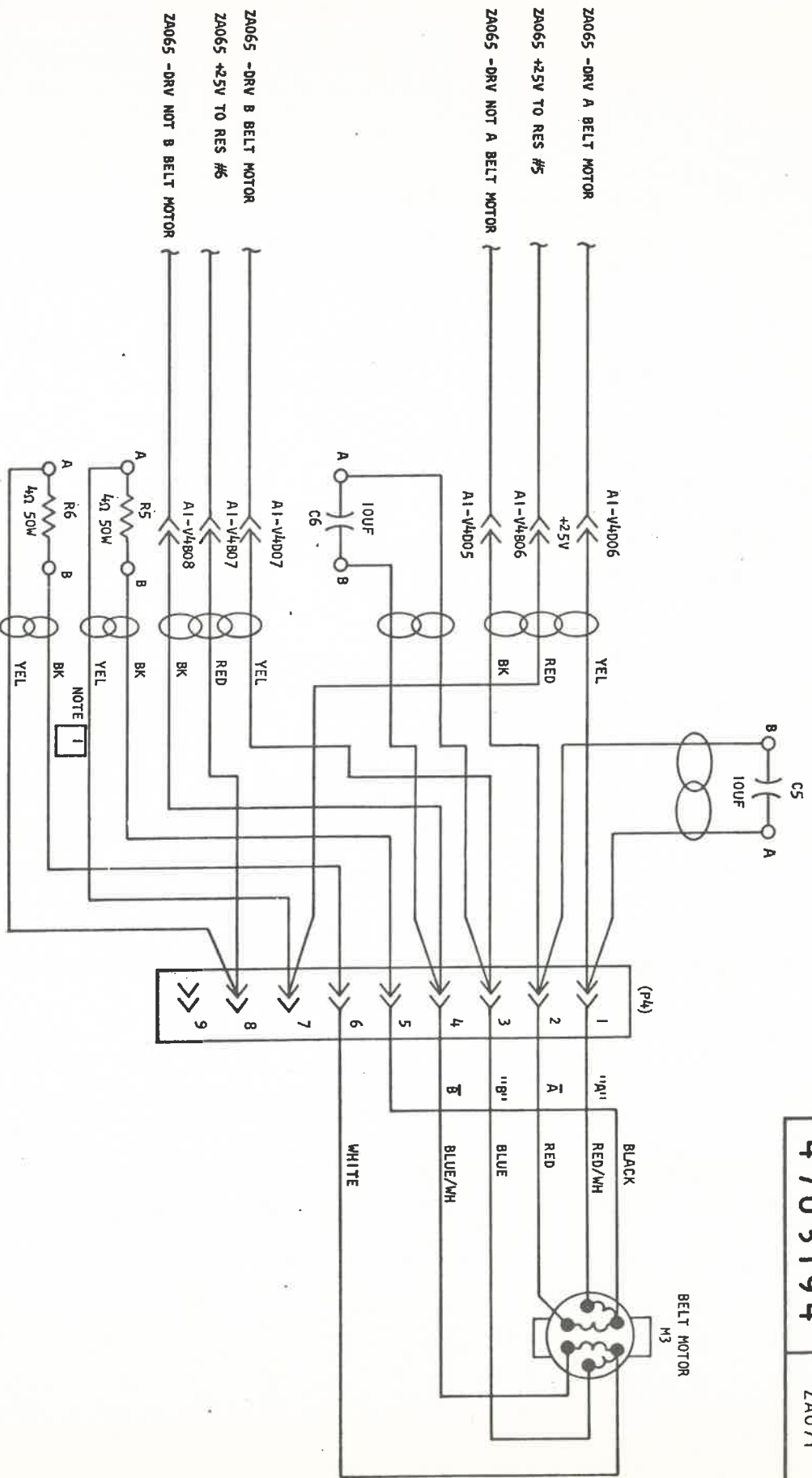




4703194

C

PART NO 4703194 LOGIC PG NO ZA071



NOTE  
1. CIRCLES DESIGNATE TWISTED PAIR  
OR TRIPLE TWISTED WIRES.

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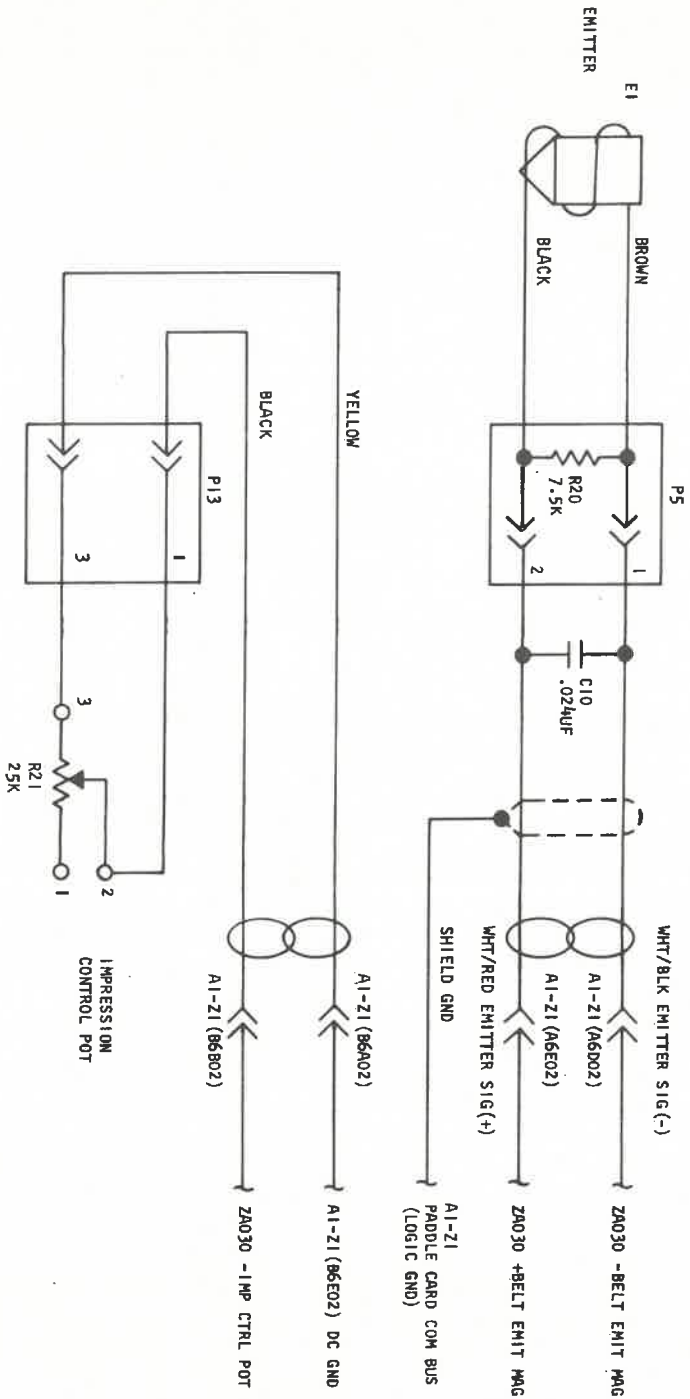
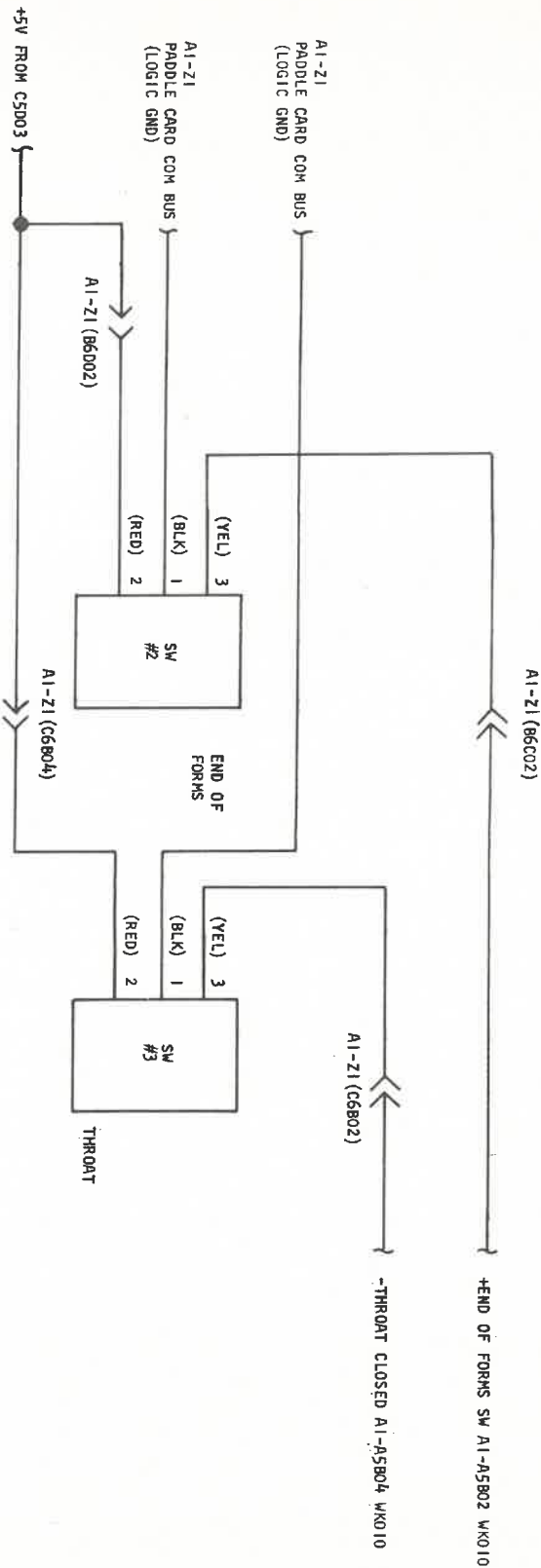
NAME		DATE	CHANGE NO	DATE	CHANGE NO
BELT MOTOR, LEFT RIBBON MOTOR,		24JAN77	1495290		
LEFT SPOOL SWITCH		10AUG77	359424		
DESIGN	SHT OF	60EC77	356703		
DETAIL	VD FEB77	7FEB78	359422		
CHECK	C.D.B.	28JAN77			
APPRO	R.C.H.	9FEB77			
		RCH	28FEB77		
		MUST CONFORM TO ENG SPEC		DEVELOPMENT NO	LOGIC PG NO
					ZA071





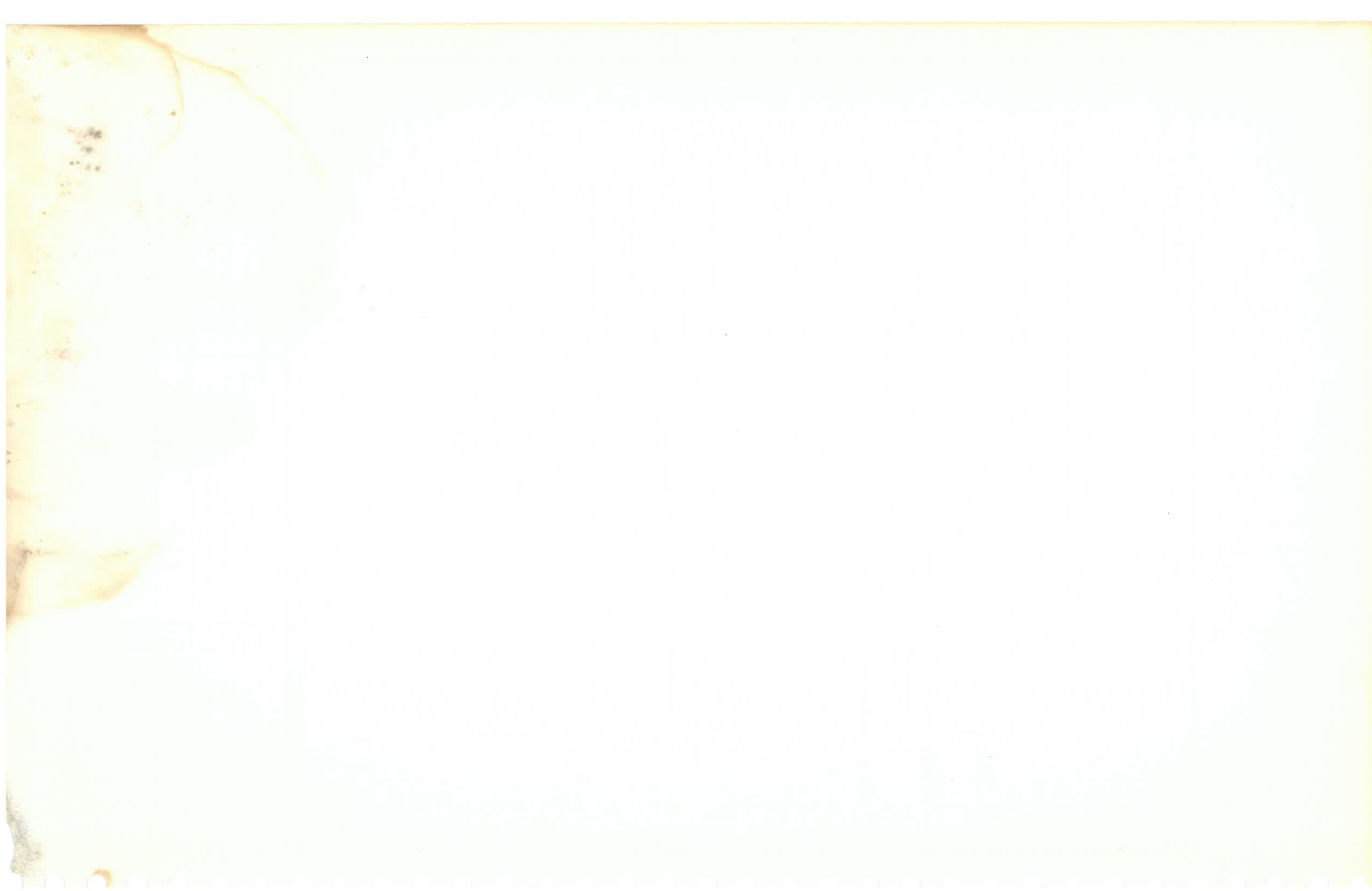
4703195 C

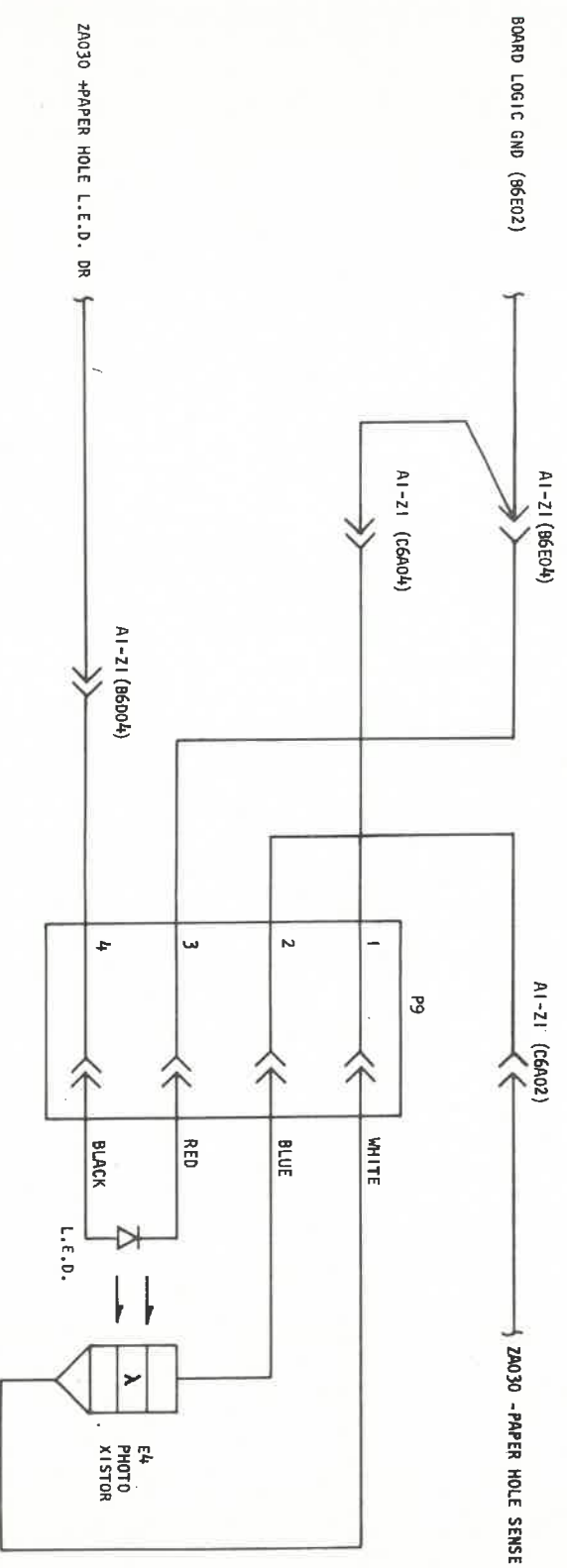
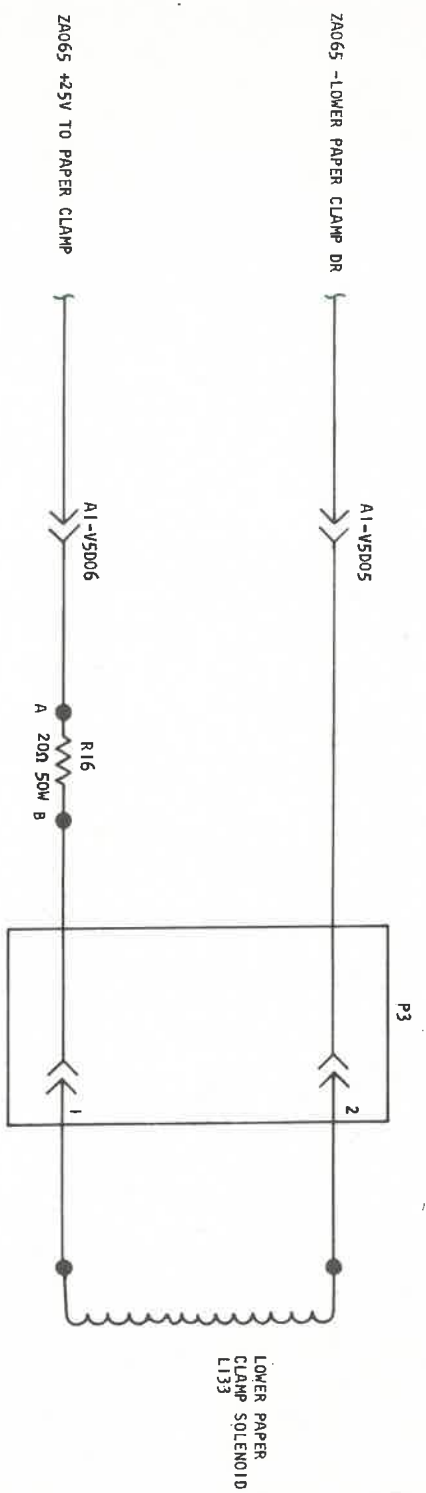
PART NO  
4703195  
TEMP PG NO  
2A74



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IBM															
NAME		BELT EMIT, IMPRESSION CNTL,			DATE		CHANGE NO		DATE		CHANGE NO				
END OF FORMS & THROAT CLOSED, SW				24JAN77		1495290									
				10AUG77		359424									
				6DEC77		356703									
DESIGN			SHT		OF										
DETAIL		L.A.I.		24JAN77		VD FEB77									
CHECK		G.D.B.		2FEB77		CI ASSN II ATION									
APPRO		R.C.H.		9FEB77		1.74		28/FEB/77							
				MUST CONFORM TO ENG SPEC				DEVELOPMENT NO				LOGIC PG NO			
												ZA080			





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NAME		LOWER PAPER CLAMP AND PAPER		DATE	CHANGE NO	DATE	CHANGE NO
HOLE SENSE				24 JAN 77	1495290		
DESIGN	L.A.I.	SHT OF		10 AUG 77	359424		
DETAIL	2 FEB 77	VD FEB 77		6 DEC 77	356703		
CHECK	G.D.B.	CI ASSURIFICATION					
APPRO	R.C.H.	1972 28 FEB 77				LOGIC PG NO	ZA081
				4703196 C			

MINI 280822204 VERTICAL ELECTRICAL FORMAT ATTACHED MAPS



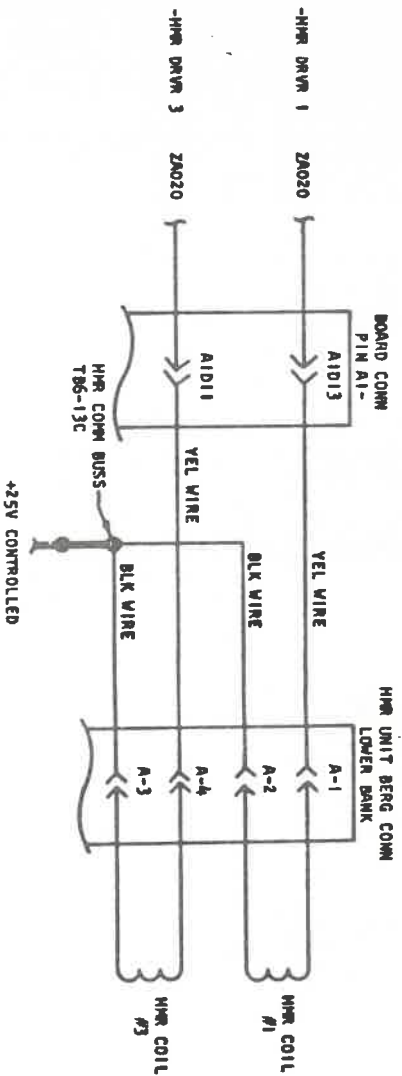








C 4703200



HMR POS NO. AND SOURCE PAGE	BOARD CONN PIN (A1-)	HMR UNIT BERG CONN DRIVE	HMR UNIT BERG CONN CONN	HMR CONN BUSS (TB)
1 - ZA020	AID13	A-1	A-2	TB6-13C
3 - ZA020	AID11	A-4	A-3	
5 - ZA020	AIE13	A-5	A-6	TB6-13A
7 - ZA020	AIE11	A-8	A-7	
9 - ZA020	BIA13	A-9	A-10	TB6-13B
11 - ZA020	BIA11	A-12	A-11	
13 - ZA020	BIB13	A-13	A-14	TB6-12C
15 - ZA020	BIB11	A-16	A-15	
17 - ZA020	BIC13	A-17	A-18	TB6-12A
19 - ZA020	BIC11	A-20	A-19	
21 - ZA020	BID13	A-21	A-22	TB6-12B
23 - ZA020	BID11	B-2	B-1	
25 - ZA020	CIA13	B-3	B-4	TB6-11C
27 - ZA020	CIA11	B-6	B-5	
29 - ZA020	CIB13	B-7	B-8	TB6-11A
31 - ZA020	CIB11	B-10	B-9	
33 - ZA020	CIC13	B-11	B-12	TB6-11B
35 - ZA020	CIC11	B-14	B-13	
37 - ZA020	CID13	B-15	B-16	TB6-10C
39 - ZA020	CID11	B-18	B-17	
41 - ZA020	CIE13	B-19	B-20	TB6-10A
43 - ZA020	CIE11	B-22	B-21	
45 - ZA020	DIE13	C-1	C-2	TB6-10B
47 - ZA020	DIE11	C-4	C-3	
49 - ZA020	EIA13	C-5	C-6	TB6-9C
51 - ZA020	EIA11	C-8	C-7	
53 - ZA020	EIB13	C-9	C-10	TB6-9A
55 - ZA020	EIB11	C-12	C-11	
57 - ZA020	EIC13	C-13	C-14	TB6-9B
59 - ZA020	EIC11	C-16	C-15	
61 - ZA020	EID13	C-17	C-18	TB6-8C
63 - ZA020	EID11	C-20	C-19	
65 - ZA020	EIE13	C-21	C-22	
67 - ZA020	EIE11	D-2	D-1	TB6-8A

HMR POS NO. AND SOURCE PAGE	BOARD CONN PIN (A1-)	HMR UNIT BERG CONN DRIVE	HMR UNIT BERG CONN CONN	HMR CONN BUSS (TB)
69 - ZA020	FIB13	D-3	D-4	TB6-8B
71 - ZA020	FIB11	D-6	D-5	
73 - ZA020	FIC13	D-7	D-8	TB6-7C
75 - ZA020	FIC11	D-10	D-9	
77 - ZA020	FID13	D-11	D-12	TB6-7A
79 - ZA020	FID11	D-14	D-13	
81 - ZA020	FIE13	D-15	D-16	TB6-7B
83 - ZA020	FIE11	D-18	D-17	
85 - ZA020	GIA13	D-19	D-20	TB6-6C
87 - ZA020	GIA11	D-22	D-21	
89 - ZA020	HIA13	E-1	E-2	TB6-6A
91 - ZA020	HIA11	E-4	E-3	
93 - ZA020	HIB13	E-5	E-6	TB6-6B
95 - ZA020	HIB11	E-8	E-7	
97 - ZA020	HIC13	E-9	E-10	TB6-5C
99 - ZA020	HIC11	E-12	E-11	
101 - ZA020	HID13	E-13	E-14	TB6-5A
103 - ZA020	HID11	E-16	E-15	
105 - ZA020	HIE13	E-17	E-18	TB6-5B
107 - ZA020	HIE11	E-20	E-19	
109 - ZA020	JIA13	E-21	E-22	TB6-4C
111 - ZA020	JIA11	F-2	F-1	
113 - ZA020	JIC13	F-3	F-4	TB6-4A
115 - ZA020	JIC11	F-6	F-5	
117 - ZA020	JID13	F-7	F-8	TB6-4B
119 - ZA020	JID11	F-10	F-9	
121 - ZA020	JIE13	F-11	F-12	TB6-3C
123 - ZA020	JIE11	F-14	F-13	
125 - ZA020	KIA13	F-15	F-16	TB6-3A
127 - ZA020	KIA11	F-18	F-17	
129 - ZA020	KIB13	F-19	F-20	
131 - ZA020	KIB11	F-22	F-21	TB6-3B

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NAME		HMR 10115 MOD POSITIONS MOD JT		DATE		CHANGE NO		DATE		CHANGE NO	
				24JAN77		149529U					
				60EC77		356703					
DESIGN		SMT	CP								
DETAIL	L.A.I.	20JAN77	VO FEB77								
CHECK	G.D.B.	22JAN77	CLASSIFICATION	MUST CONFORM TO ENG SPEC		DEVELOPMENT NO		LOGIC PG NO		2A110	
APPRO	R.C.H.	9FEB77	Rev 18 FEB77								

440 0154

GROUP 1000000000

VERTICAL ELECTRICAL FORMAT

ASTM/ISO 9000

4703200 C



4703202

PART NO  
4703202

LOGIC PG. NO  
ZA120

Z6010	-HHR	DRVH	2
Z6010	-HHR	DRVH	4
Z6010	-HHR	DRVH	6
Z6010	-HHR	DRVH	8
Z6010	-HHR	DRVH	10
Z6010	-HHR	DRVH	12
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Z6010	-HHR	DRVH	16
Z6010	-HHR	DRVH	18
Z6010	-HHR	DRVH	20
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Z6010	-HHR	DRVH	124
Z6010	-HHR	DRVH	126
Z6010	-HHR	DRVH	128
Z6010	-HHR	DRVH	130
Z6010	-HHR	DRVH	132
H010 -POR			
Z0040	-CLOSE	CONTRACTOR	
Z0010	-MMOT	PRINT TIME CHECK	
Z0035	-M01		
Z0035	-M03		
Z0035	-INITIATE	SAMPLE RING RESET	
Z0030	-HAMPER	SAMPLE	
			D09

DO6 ----- 2A030 HAMMER ECHO RTN

B06	—	-OUT	CAP 2-46	(T.P.)
B07	—	-OUT	CAP 46-94	(T.P.)
B09	—	-OUT	CAP 96-132	(T.P.)
B10	—	-OUT	CAP 95-131	(T.P.)
B11	—	-OUT	CAP 47-93	(T.P.)
B12	—	-OUT	CAP 1-45	(T.P.)

CONTINUED ON ZA130

A1-M2

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ECHO (HICK TWIN POSITIONS MOD II)				DATE	CHANGE NO.	DATE	CHANGE NO.
NAME	ECHO	24JAN77	1495290				
		6DEC77	356703				
DESIGN		SMT OF					
DETAIL	L.A.I.	2FEB77	V0 FEB77				
CHECK	G.D.B.	4FFB77	CLASSIFICATION	MUST CONFORM TO ENG SPEC	DEVELOPMENT NO	LOGIC PG NO	
APPRO	R.C.M.	9FE877	F4420A77			ZAI20	

4 70 3202 C

630 01501      0002 700611 04      VERTICAL ELECTRICAL FORMAT      45° 50C/57° 0000

**THE**

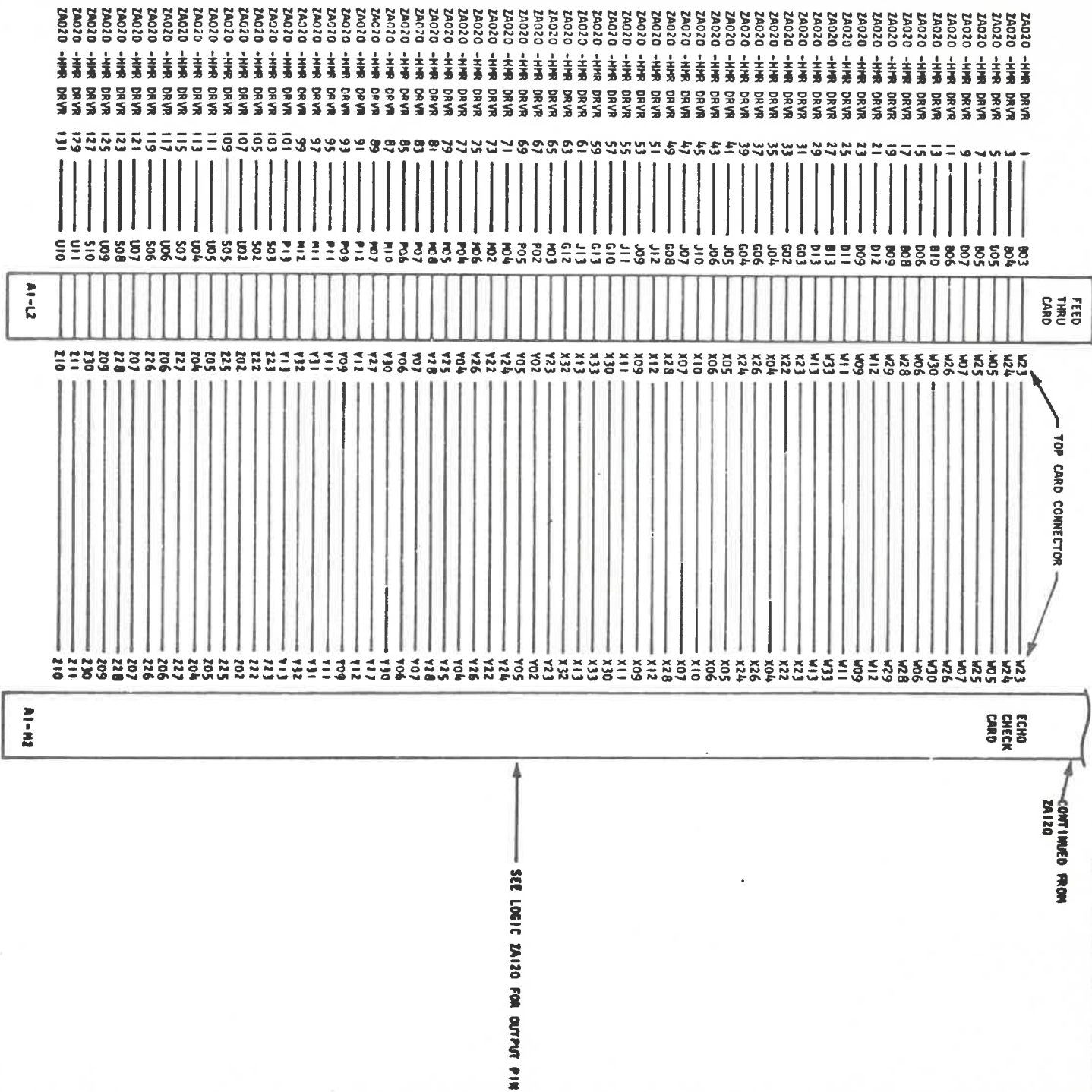




4703203 C

MOD II

PART NO  
4703203  
LOGIC PG NO  
ZA130



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IBM		DATE	CHANGE NO	DATE	CHANGE NO	4703203 C
NAME ECHO CHECK MOD II		24JAN77	149529U			
DESIGN			60EC77	356703		
DETAIL	L.A.I.	2FEB77	VO FEB77			
CHECK	G.B.B.	4FEB77	CLASSIFICATION	MUST CONFORM TO ENG SPEC	DEVELOPMENT NO	
APPRO	R.C.M.	9FEB77	9FEB77		LOGIC PG NO	
						ZA130

820 0134 1 MOD II 7-00000000 VERTICAL ELECTRICAL FORMAT 82000000000000000000





4703229

C

PART NO 4703229 LOGIC PG NO Z2010

5211 MOD I - II

COMPONENT	PART NUMBER	DESCRIPTION	FUNCTION	LOGIC PAGE
C1, C2	5252809	8UF	CARRIAGE MOTOR	ZA070
C5, C6	5252810	10 UF	BELT MOTOR	ZA071
C7	5252740	100K UF	FILTER CAP	ZZ020
C10	217046	.024 UF	EMITTER	ZA080
D1	369649	ZENER DIODE	+24V CLAMP	ZZ020
D2	615354	DIODE ASM-AM	SUPPRESSION DIODE	ZZ020
E1	1803793	TRANSDUCER	PRINT EMITTER (PSS)	ZA080
E2	6808527	LED/PT ASSEMBLY	BELT EMITTER	ZA082
E3	6808527	LED/PT ASSEMBLY	CARRIAGE EMITTER	ZA082
E4	1812301	LED/PT ASSEMBLY	PAPER MOTION SENSE	ZA081
K1	2410111	RELAY	+25V CONTROLLED	ZZ020
L1-66	1800796	HAMMER COIL	HAMMER ACTUATE MOD I	ZA100
L1-132	1800796	HAMMER COIL	HAMMER ACTUATE MOD II	ZA100-ZA110
L133	1812547	COIL MAGNET	PAPER CLAMP	ZA081
M1	4703237	DC MOTOR	CARRIAGE DRIVE	ZA070
M2	4138363	DC MOTOR	RIGHT RIBBON DRIVE	ZA070
M3	1816039	DC MOTOR	BELT DRIVE	ZA071
M4	4138363	DC MOTOR	LEFT RIBBON DRIVE	ZA071
M5	4703240	AC MOTOR (200V)	FAN 50/60HZ	YF001
M5	4703241	AC MOTOR(208-240V)	FAN 50/60HZ	YF001
P1, P2, P4, P6		9 POS CONN	CARR, RIGHT AND LEFT RIBBON, BELT MOTORS	ZA070-ZA071
P3, P5		2 POS CONN	PAPER CLAMP, BELT EMITTER	ZA081-ZA080
P7		3 POS CONN	LOGIC GATE FAN	YF001
P8		16 POS CONN	OPERATOR PANEL	ZA002
P9		4 POS CONN	PAPER HOLE SENSE	ZA081
P13		3 POS CONN	IMPRESSION CONTROL POT	ZA080



COMPONENT LISTING

NAME	DATE	CHANGE NO	DATE	CHANGE NO
DESIGN				
DETAIL	GDB 2MAY77	SHT 1 OF 1	27JUN77	359424
CHECK	LAI 6MAY77	CLASSIFICATION	6DEC77	356703
APPRO	RCH 6MAY77	RCH 12JUL77	7FEB78	359422
MUST CONFORM TO ENG SPEC				
DEVELOPMENT NO				
LOGIC PG NO				
Z2010				

4703229

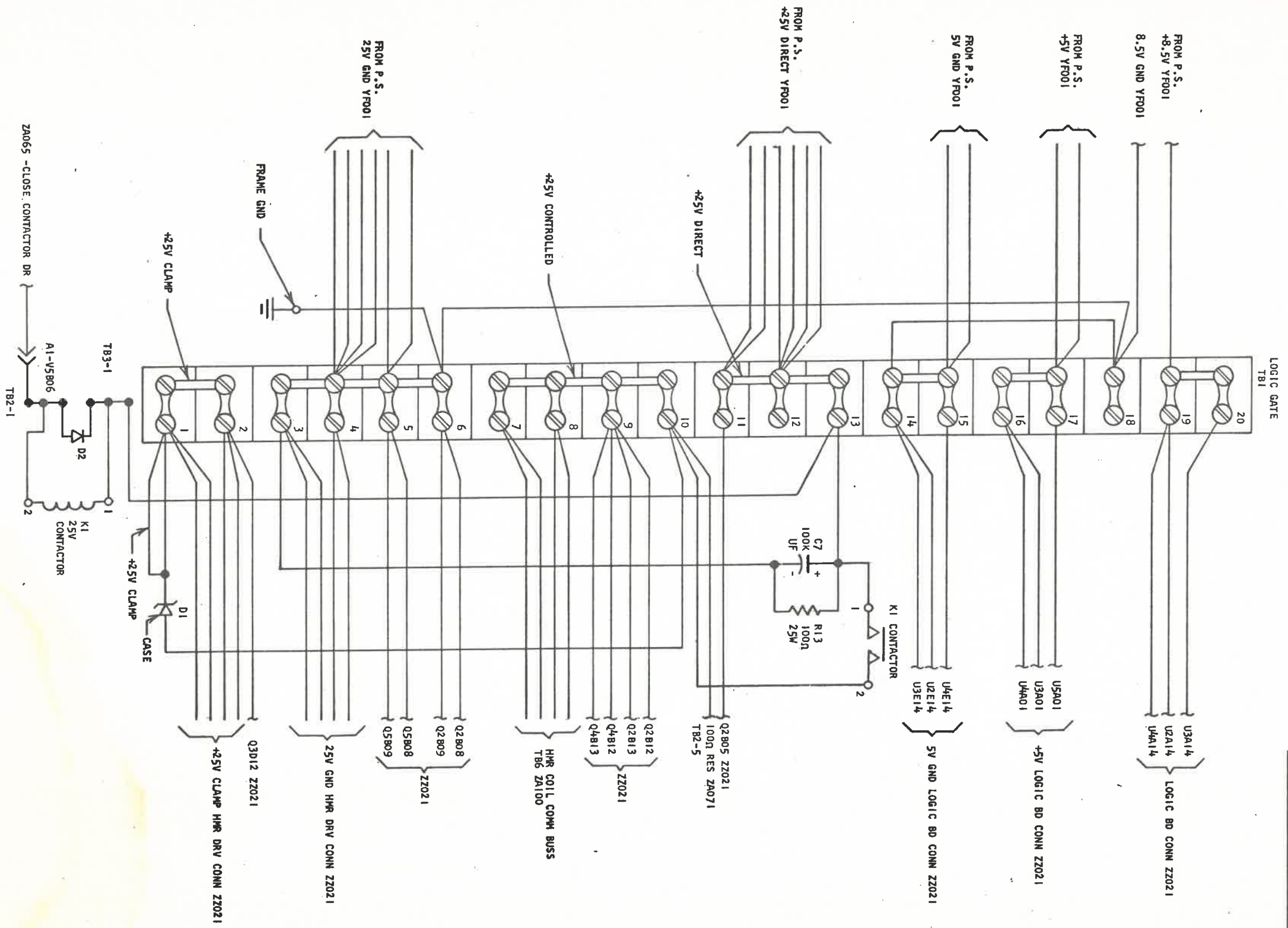
C











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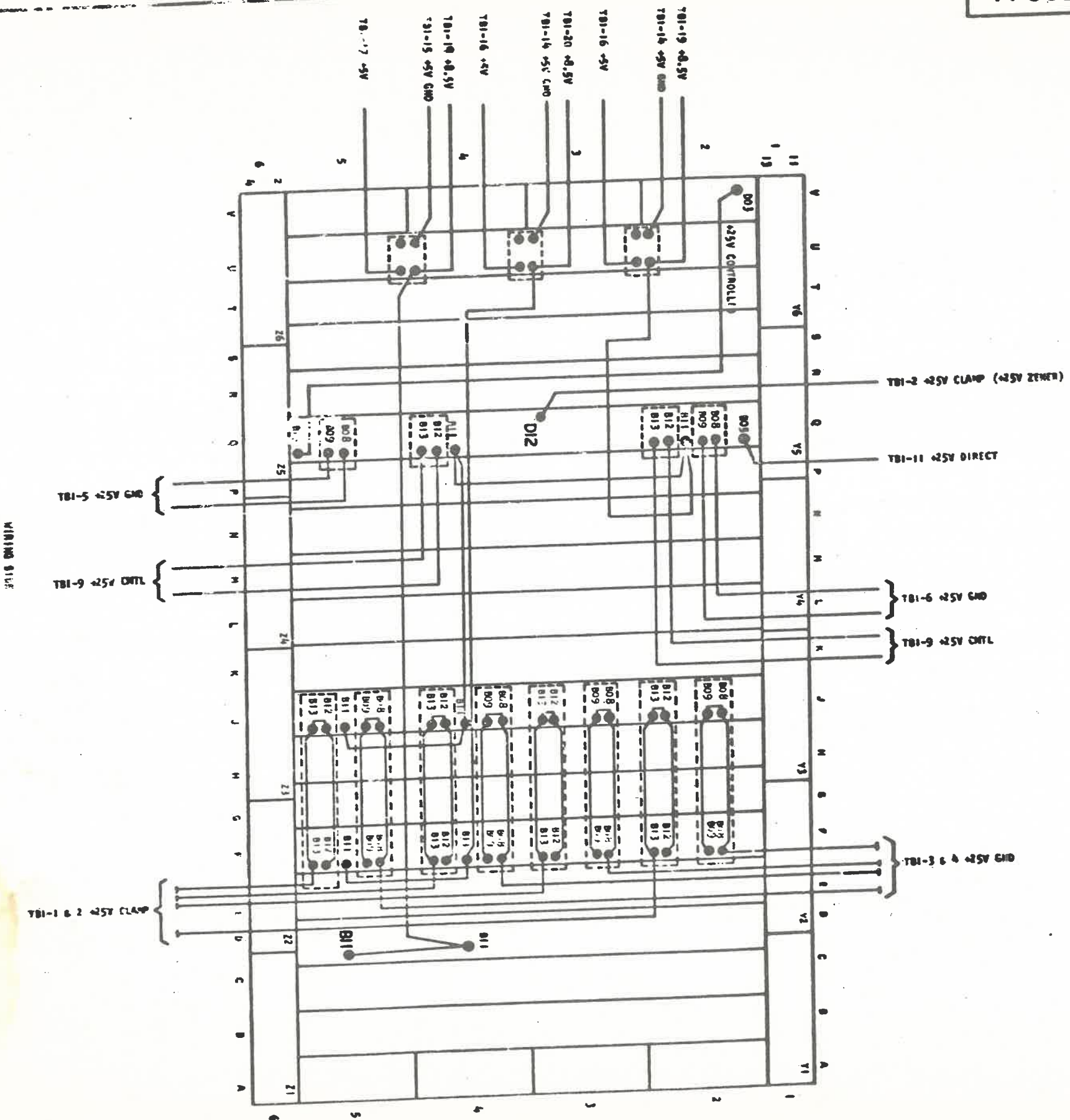
NAME		DATE	CHANGE NO	DATE	CHANGE NO
LOGIC GATE T81		24 JAN 77	149529U		
		10 AUG 77	359424		
		6 DEC 77	356703		
		7 FEB 78	359422		
DESIGN	L.A.I.	3 FEB 77	VD FEB 77		
DETAIL	G.D.B.	7 FEB 77	CLASSIFICATION		
CHECK	R.C.H.	9 FEB 77	RCH	28 FEB 77	
APPRO					
MUST CONFORM TO ENG SPEC				DEVELOPMENT NO	LOGIC PG NO
					ZZ020





4703206

C

PART 111  
47032061 (CART. PRO. NO.)  
77021

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IBM

NAME DATE VOLTAGE DISTRIBUTION

DESIGN L.A.I. 26 JAN 77 SHT 1 OF 1

CHECK G.D.B. 7 FEB 77

DATE 11 21

DATE

CHANGE NO

DATE

CHANGE NO

JUST CONFORM TO THE SPEC

DEVELOPMENT NO

LOGIC PG NO

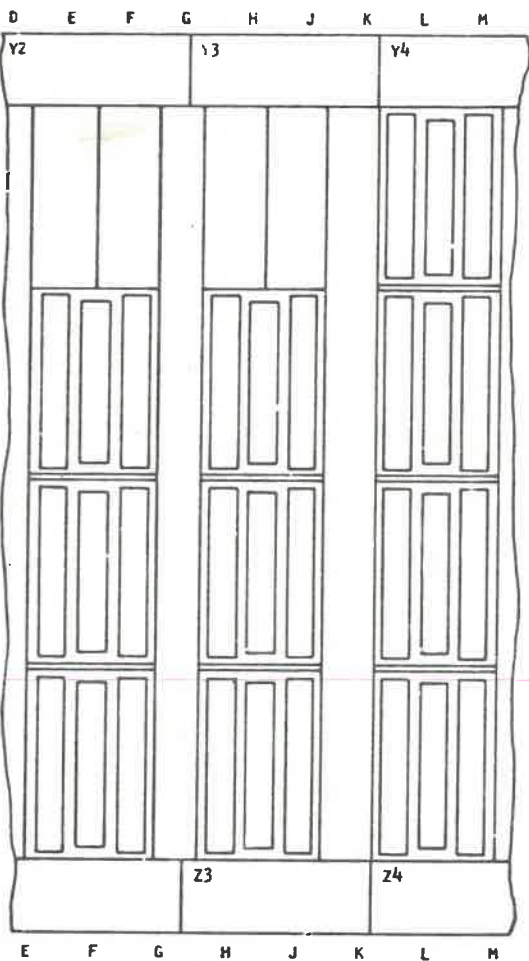
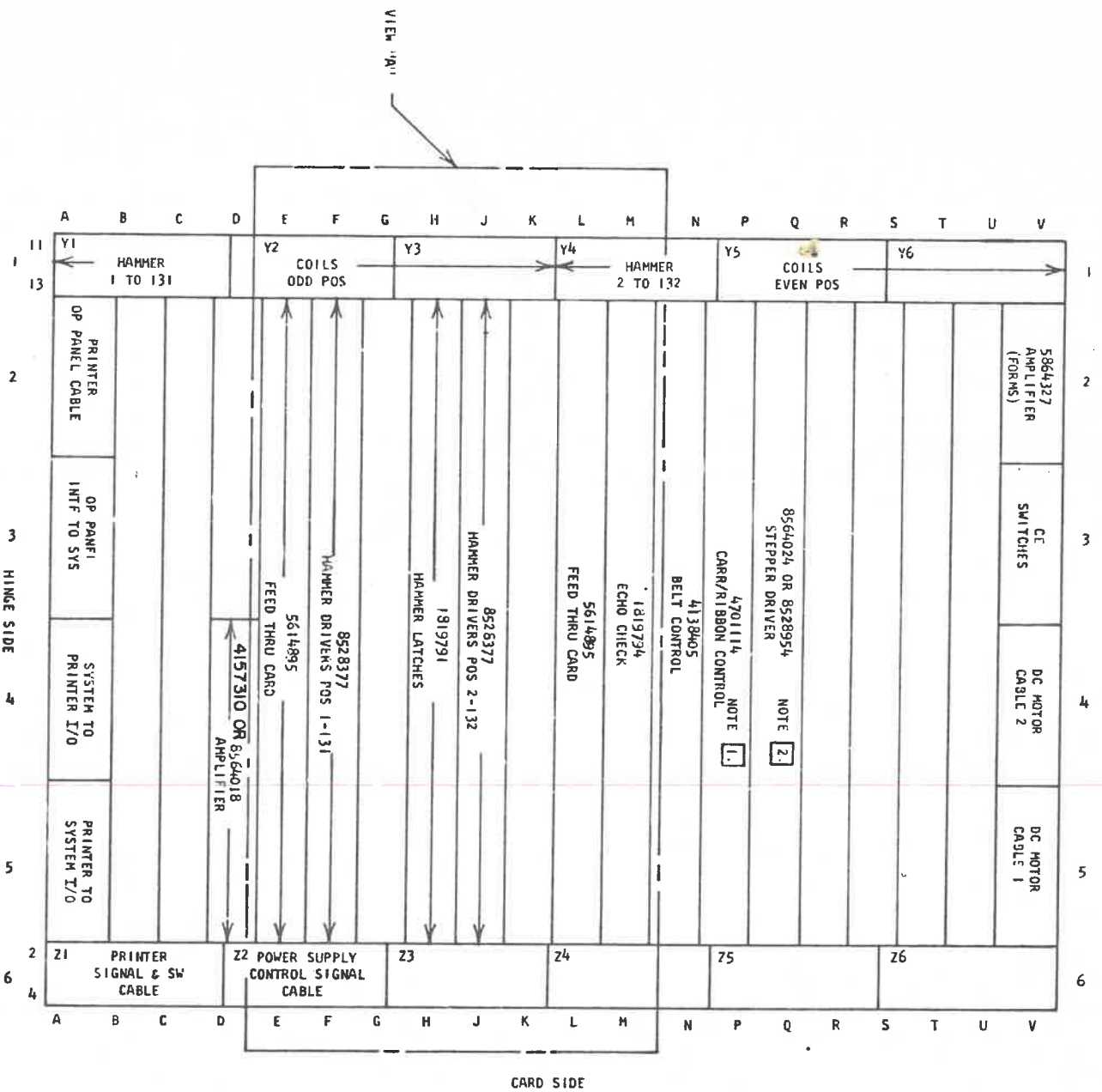
4703206



MOD TJ

PAID TO  
4703208

CS NO  
22025



TOP CARD CONNECTOR  
1794410 (10) LOCATIONS  
VIEW "A"

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NOTES

1. SOME PRINTERS HAVE PART NUMBER 4701110 INSTALLED.  
IF REPLACEMENT IS NECESSARY ORDER PART NUMBER 4701114.  
PRINTERS WITH PART NUMBER 8528944 INSTALLED, ORDER PART NUMBER 8564024 FOR REPLACEMENT.

2. IF D2 DIODE IS INSTALLED AND +V. 5V IS WIRED TO Q2811 AND Q4811. REF. LOGICS Z2020 AND Z2021

NAME				DATE	CHANGE NO	DATE	CHANGE NO
CARD LOCATION CHART MOD II				24JAN77	149523U	18APR78	784041
				10AUG77	359424	8AUG78	784049
DESIGN		SHT OF		60EC77	356703	80EC78	784101
DETAIL	L.A.I.	25JAN77	WD FEB77	7FEB78	359422	14 FEB 79	357779
CHECK	G.O.B.	7FEB77	CLASSIFIED ACTION	MUST CONFORM TO ENG SPEC		DEVELOPMENT NO	
APPRO	R.C.H.	9FEB77	RCH	28FEB77		LOGIC PG NO	
							27025





# SECTION 19: FUNCTION WIRING AND TIMING DIAGRAMS

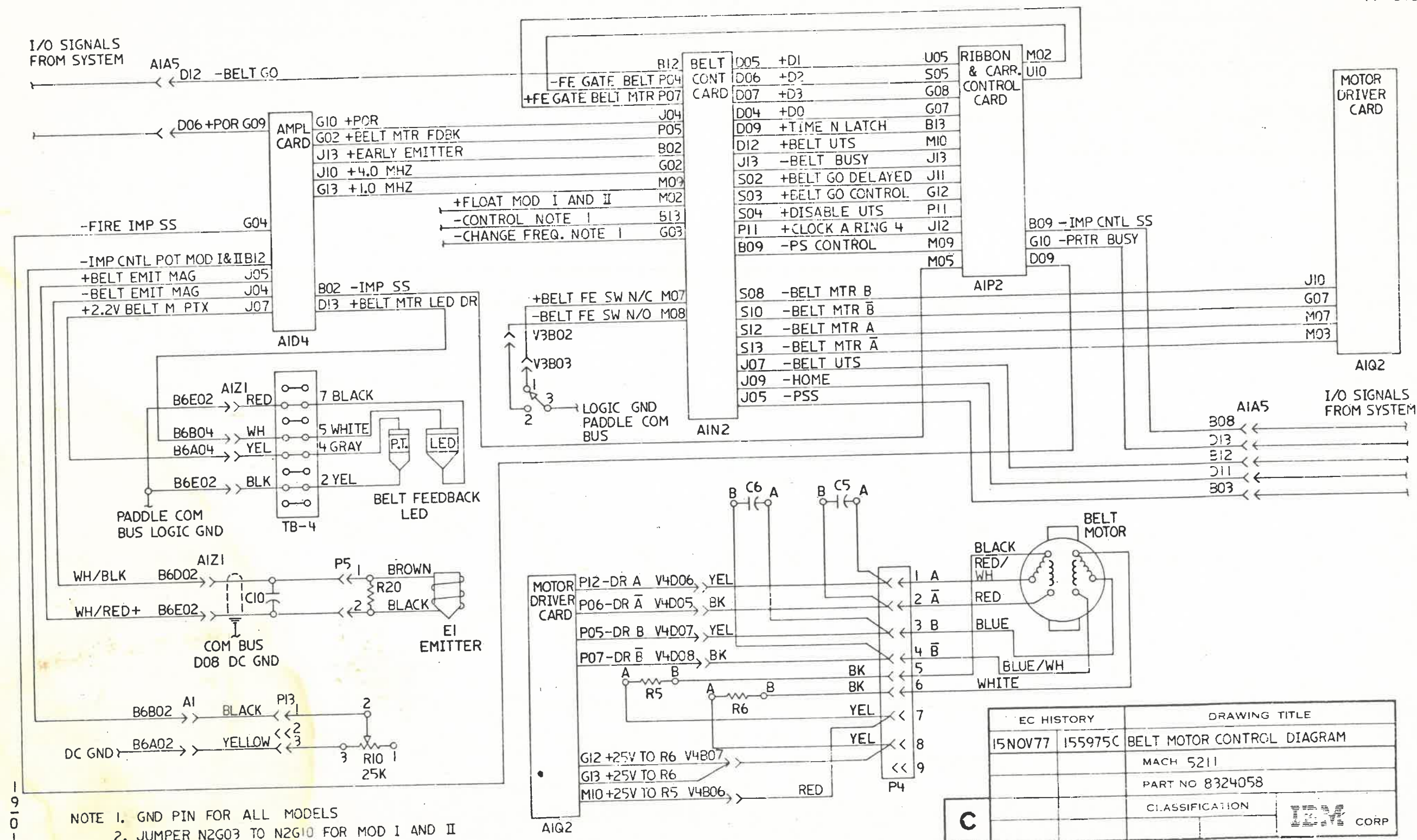
## SECTION CONTENTS

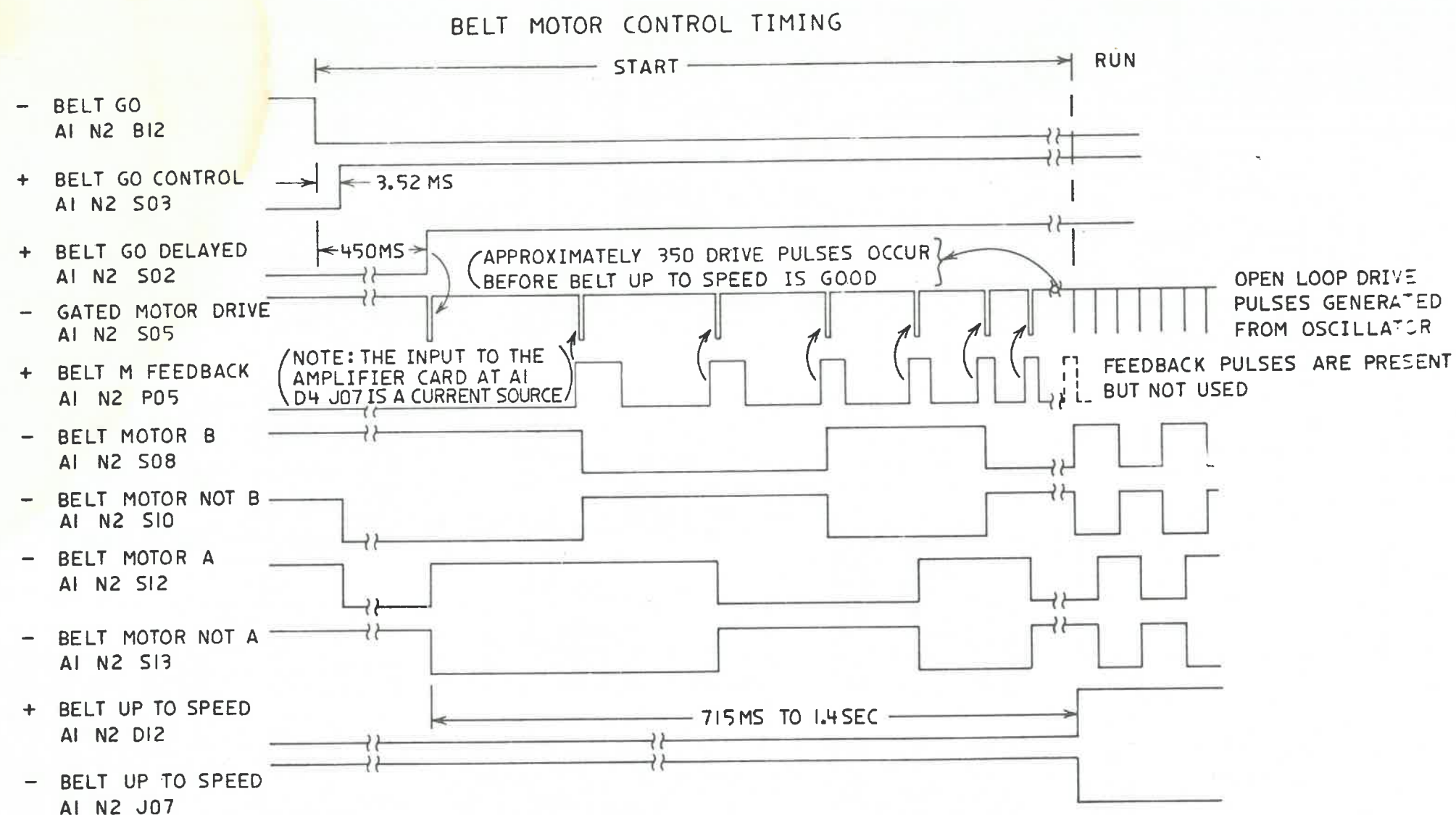
•This section contains the following 5211 Printer Function Wiring and Timing Diagrams:

<u>PAGE</u>	<u>PART NUMBER</u>	<u>TITLE</u>
19-010	8324058	Belt Motor Control Diagram
19-015	8324059	Belt Motor Control Timing
19-020	8324060	Print Subscan (PSS) Timing
19-025	8324061	Belt Motor Control Logic
19-030	8324062	Carriage Motor Control Diagram
19-035	8324063	Carriage Motor Control Timing (6/LPI)
19-040	8324064	Carriage Motor Control Logic
19-045	8324065	Carriage Motor Stop Logic
19-050	8324066	Ribbon Motor Control Diagram
19-055	8324067	Ribbon Motor Control Timing
19-060	8324068	Ribbon Motor Control Logic
19-065	8324069	Hammer Control Diagram (Model-1)
19-070	8324070	Hammer Control Diagram (Model-2)
19-075	8324071	Hammer Control Timing
19-080	8324072	Hammer Control Logic

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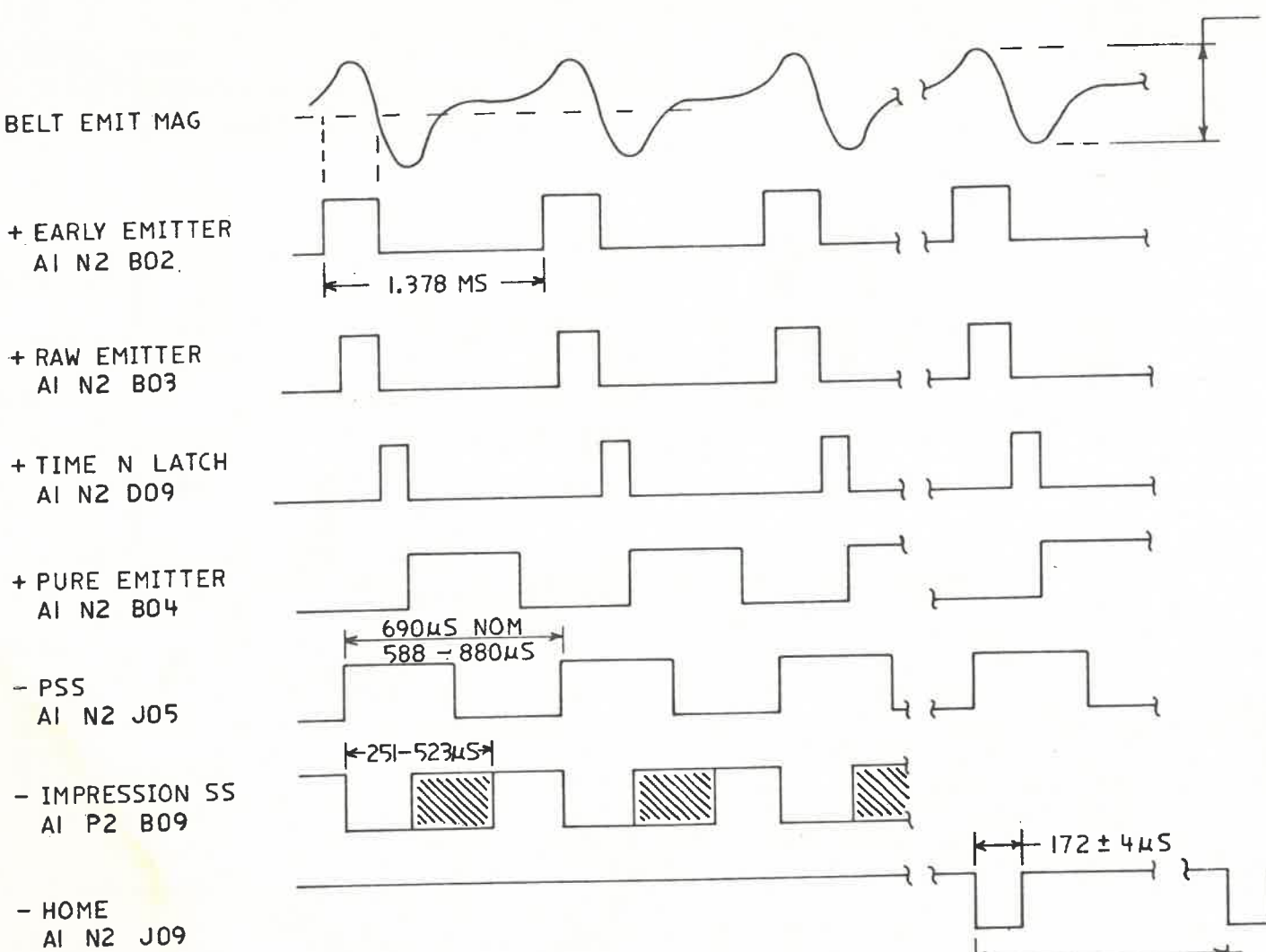




EC HISTORY		DRAWING TITLE	
15NOV77	155975C	BELT MOTOR CONTROL TIMING	
		MACH	5211
		PART NO	8234059
C		CLASSIFICATION	IBM CORP

19-015

# PRINT SUBSCAN (PSS) TIMING



1300 MV (PEAK TO PEAK)  
AT 72.5 IN/SEC BELT SPEED.  
TO OBSERVE THIS WAVE FORM,  
A DIFFERENTIAL INPUT  
OSCILLOSCOPE MUST BE USED.  
CONNECT POSITIVE INPUT  
TO AID4J05 AND NEGATIVE  
INPUT TO AID4J04. DO NOT  
GROUND EITHER LEAD.

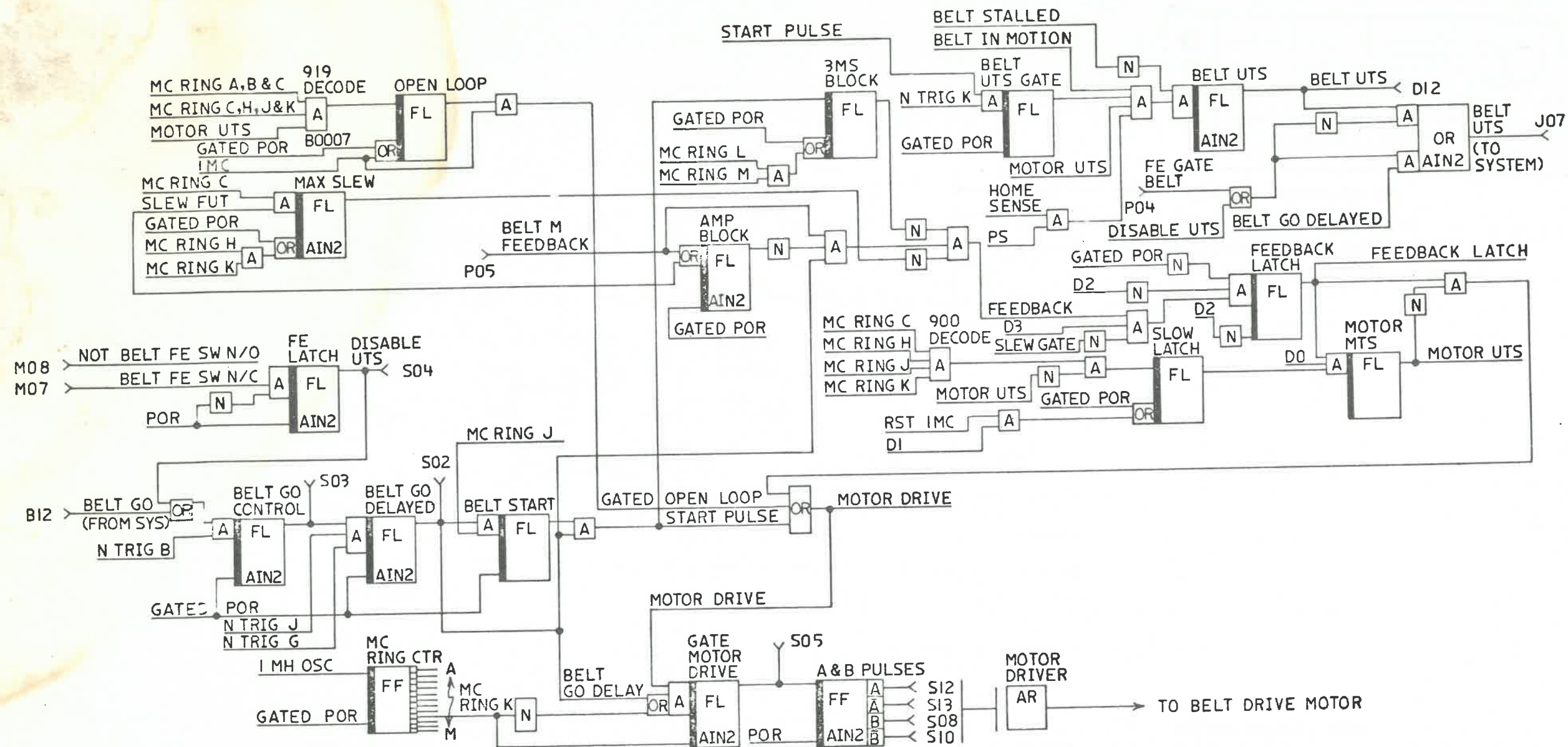
TIME (STANDARD CHARACTER SETS)  
165 MS (48 CHARACTER SET)  
220 MS (64 CHARACTER SET)  
331 MS (96 CHARACTER SET)

EC HISTORY		DRAWING TITLE	
15NOV77	155975C	PRINT SUBSCAN (PSS) TIMING	
		MACH 5211	
		PART NO 8324060	
C		CLASSIFICATION	IBM CORP

191020

191020

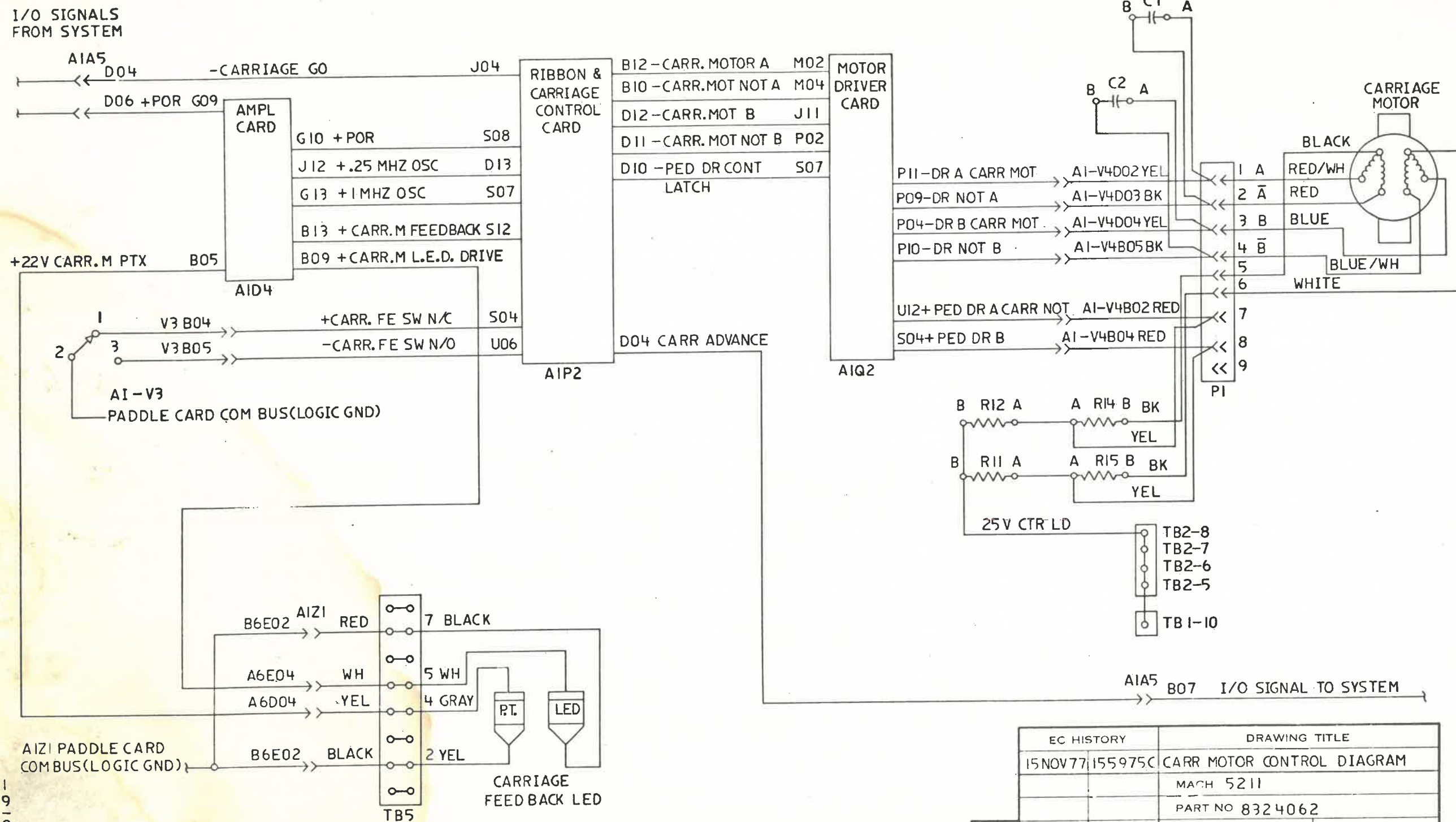




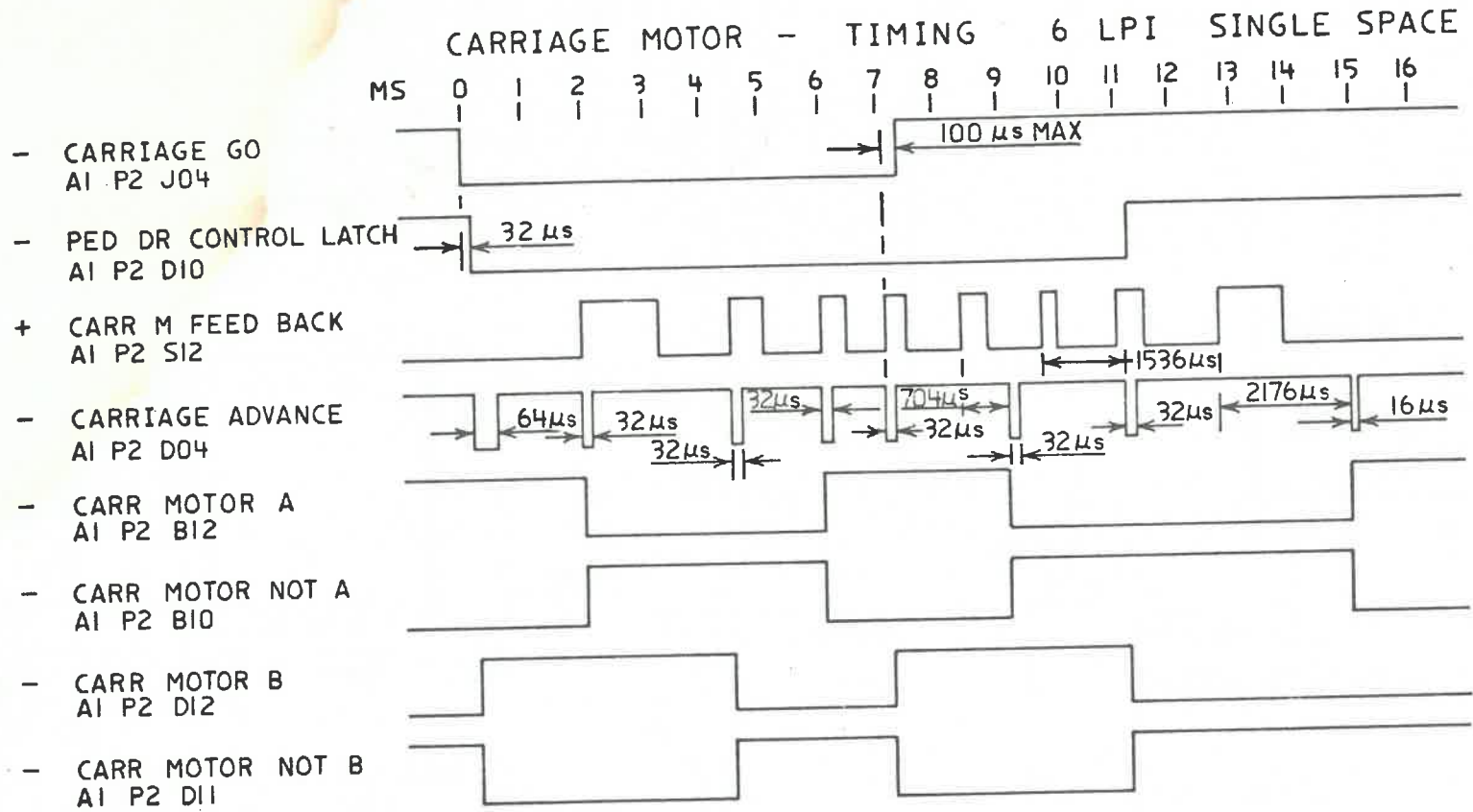
## NOTE

1. THIS DIAGRAM IS NOT A PRECISE REPRESENTATION OF ACTUAL LOGICS, BUT IS PRESENTED FOR EASE OF UNDERSTANDING OF LOGIC FLOW

EC HISTORY		DRAWING TITLE	
15NOV77	155975C	BELT MOTOR CONTROL LOGIC	
		MACH 5211	
		PART NO 8324061	
C		CLASSIFICATION	IBM CORP



C	EC HISTORY		DRAWING TITLE	
	15 NOV 77 155975C		CARR MOTOR CONTROL DIAGRAM	
			MACH 5211	
			PART NO 8324062	
			CLASSIFICATION	
				IBM CORP



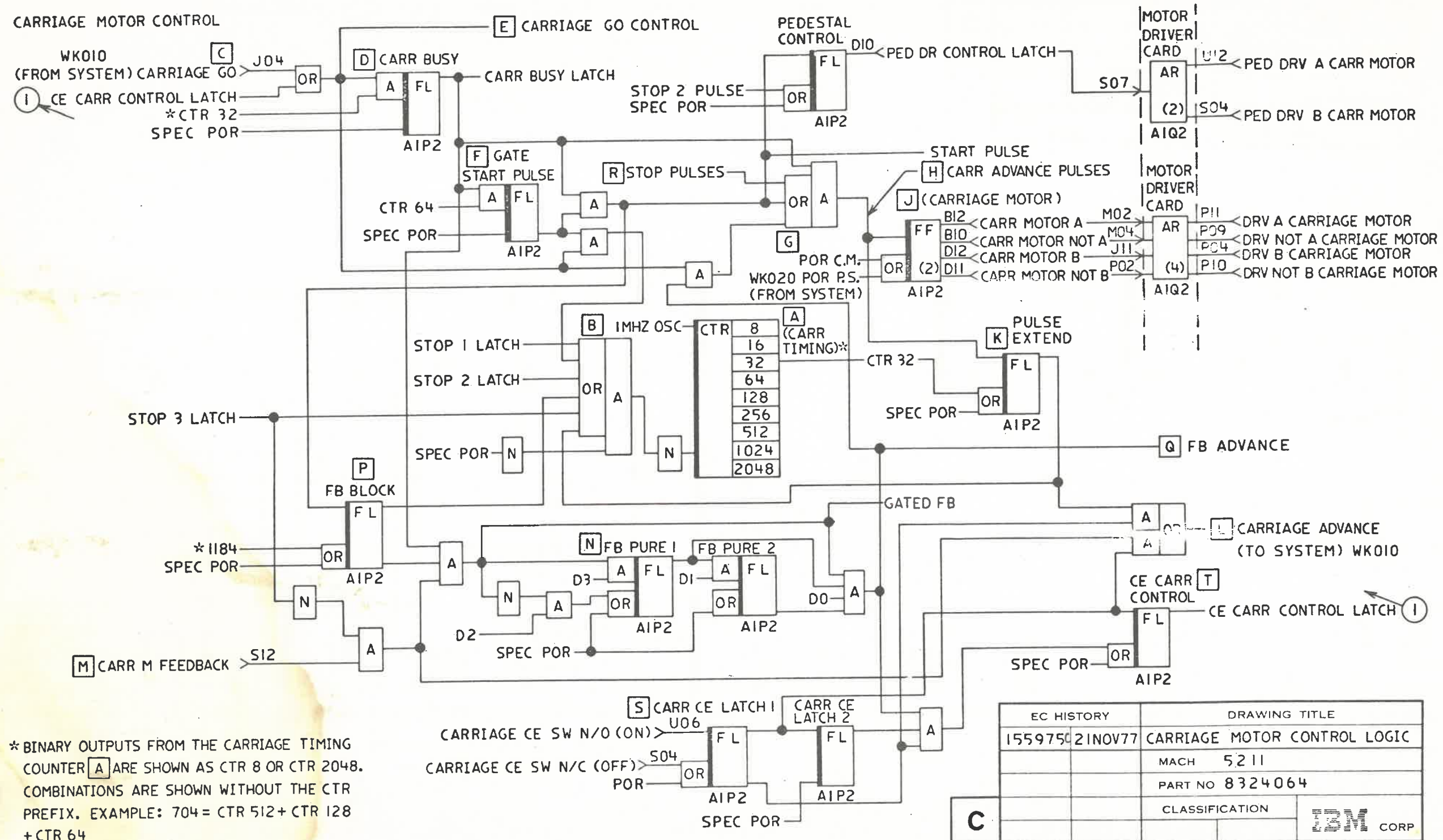
NOTE: CARR MOTOR A, NOT A,  
B, NOT B, MAYBE 180°  
FROM AS SHOWN

EC HISTORY		DRAWING TITLE	
15NOV77	155975C	CARRIAGE MOTOR CONTROL TIMING	
		MACH	5211
		PART NO	8324063
C		CLASSIFICATION	IBM CORP

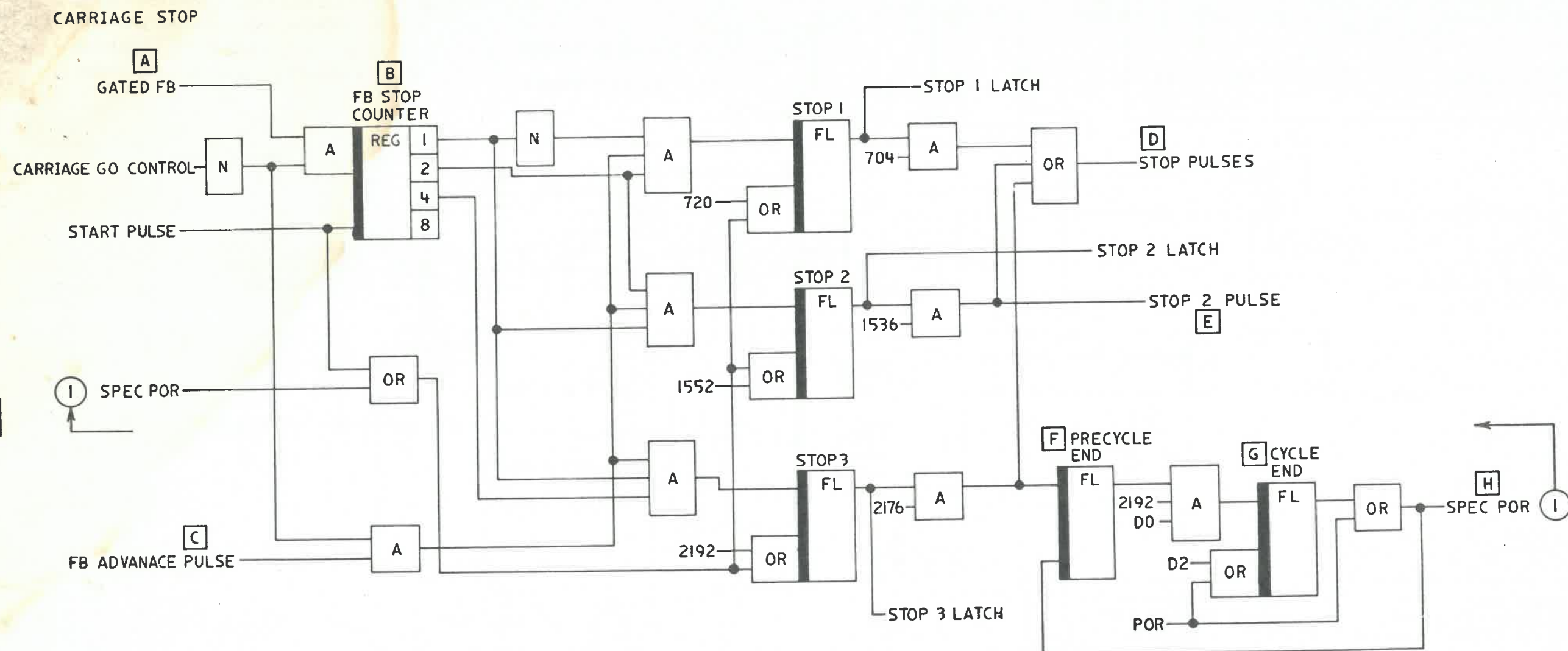
19035

19035





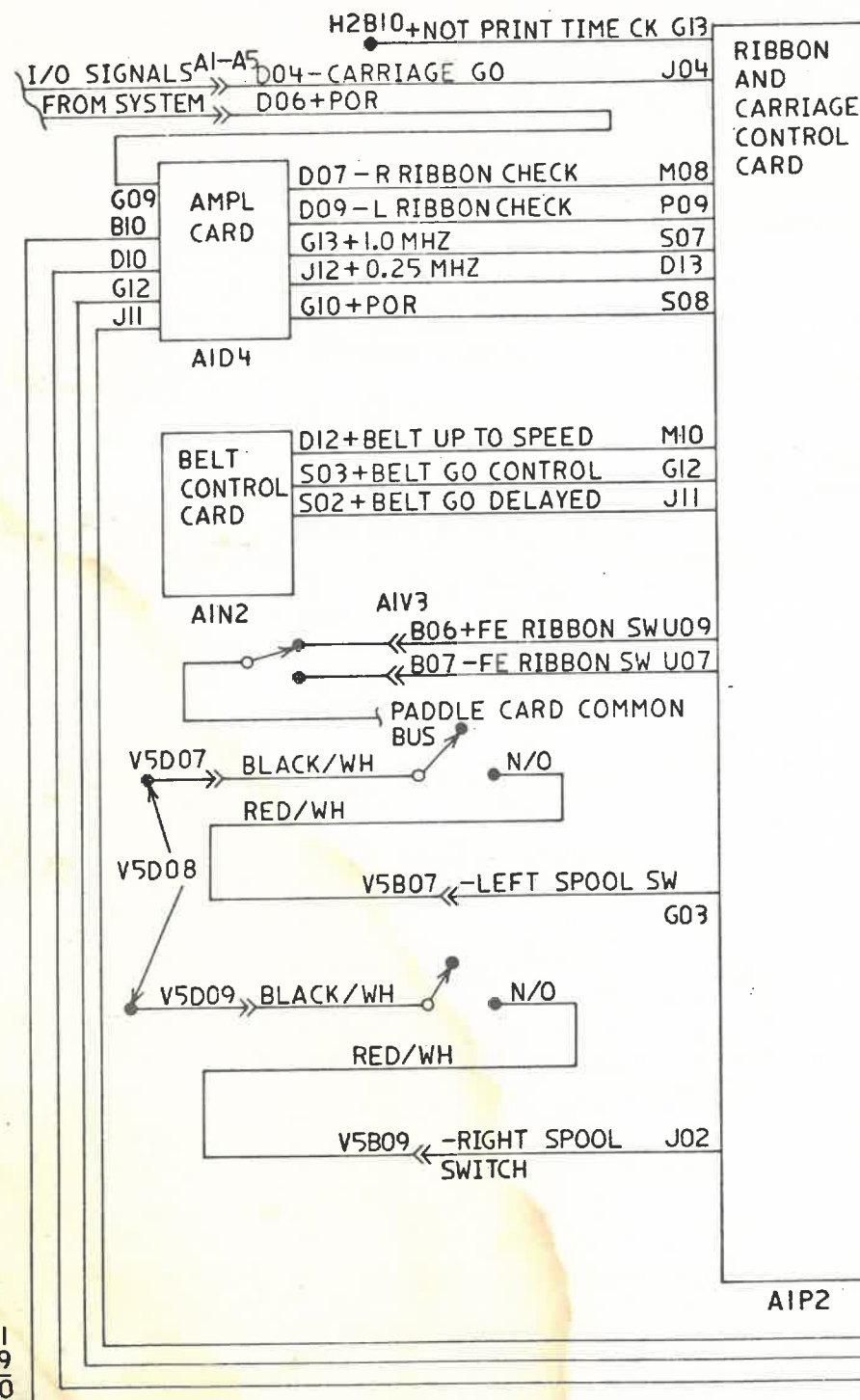
\*BINARY OUTPUTS FROM THE CARRIAGE TIMING COUNTER [A] ARE SHOWN AS CTR 8 OR CTR 2048. COMBINATIONS ARE SHOWN WITHOUT THE CTR PREFIX. EXAMPLE: 704 = CTR 512 + CTR 128 + CTR 64



EC HISTORY		DRAWING TITLE	
155975C	21NOV77	CARRIAGE MOTOR STOP LOGIC	
		MACH 5211	
		PART NO 8324065	
C		CLASSIFICATION	IBM CORP



19-050



D05-RIBBON A LEFT	D05
D06-RIBBON NOT A LEFT	B07
B05-RIBBON B LEFT	D06
B07-RIBBON NOT B LEFT	G02
J10-LEFT RIB MOTOR PED DR	U07
D10-PED DR CONTROL LATCH	S07
J07-RIBBON NOT A RIGHT	B04
G05-RIBBON A RIGHT	D04
D07-RIBBON B RIGHT	D11
B08-RIBBON NOT B RIGHT	D12
J09-RIGHT RIB MOTOR PED DR	U06

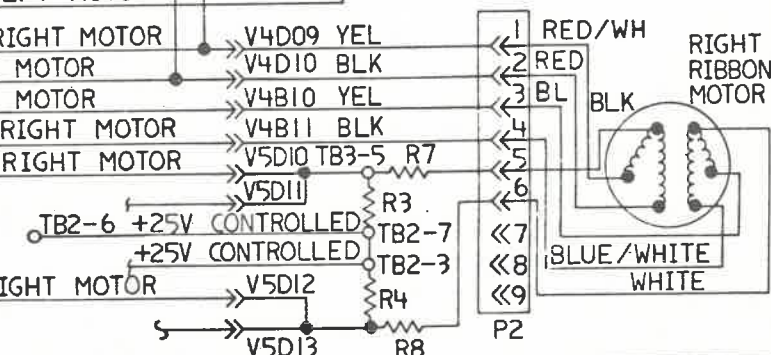
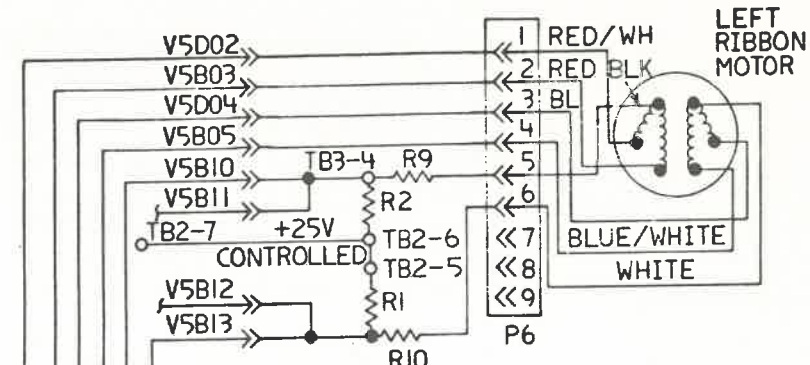
**MOTOR DRIVER CARD**

D07-DRV A LEFT MOTOR
J02-DRV NOT A LEFT MOTOR
D13-DRV B LEFT MOTOR
J06-DRV NOT B LEFT MOTOR
U04+PED DRV A LEFT MOTOR
U05+PED DRV B LEFT MOTOR

D09-DRV NOT A RIGHT MOTOR
D10-DRV A RIGHT MOTOR
J04-DRV B RIGHT MOTOR
J05-DRV NOT B RIGHT MOTOR
S02+PED DRV A RIGHT MOTOR

U02+PED DRV B RIGHT MOTOR

G09-RIBBON CHECK	AI-A5	B09	I/O SIGNALS
G10-PRINTER BUSY	D13		TO SYSTEM

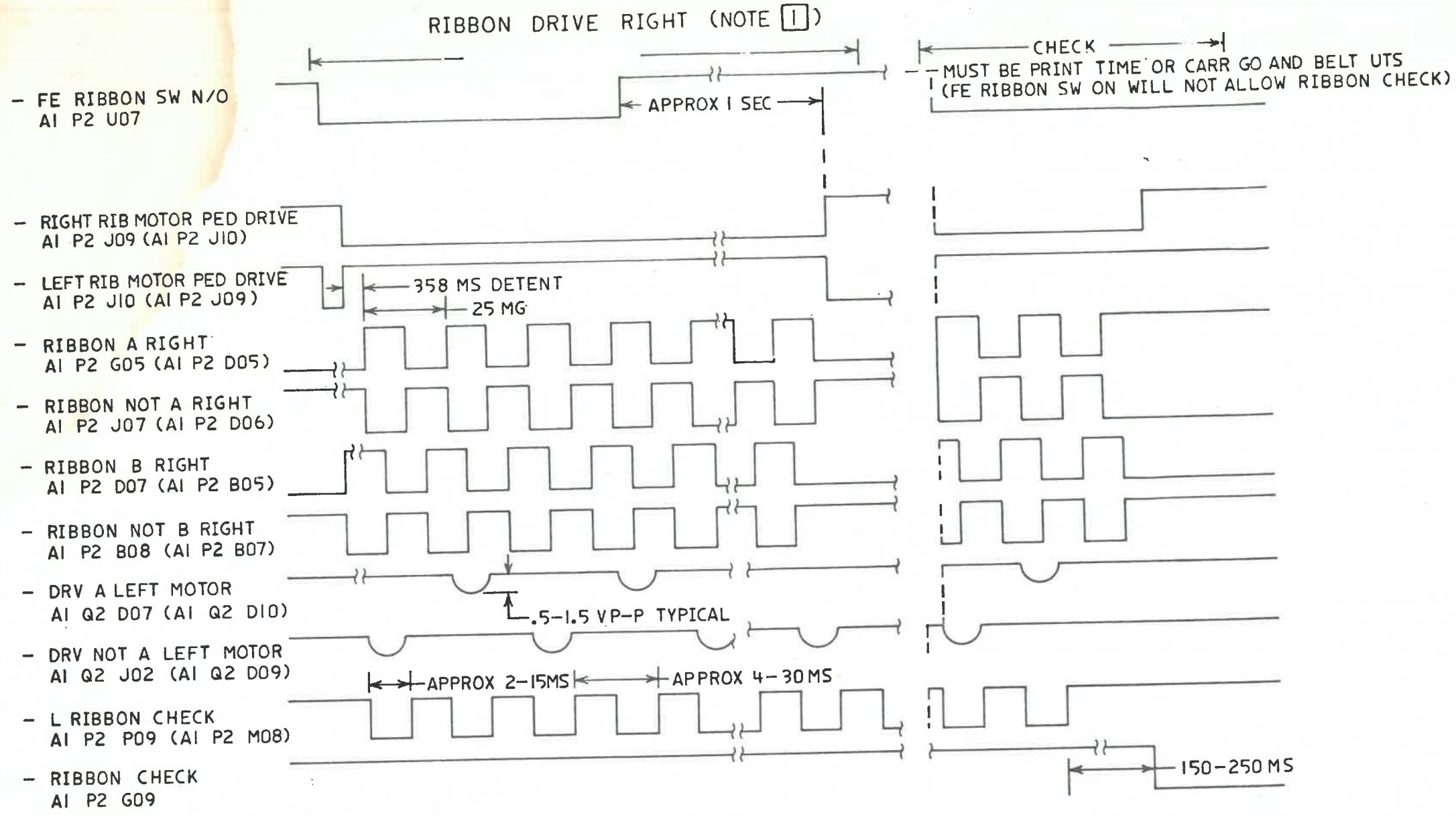


EC HISTORY		DRAWING TITLE	
15NOV77	155975C	RIBBON MOTOR CONTROL DIAGRAM	
		MACH 5211	
		PART NO 8324066	
		CLASSIFICATION	IBM CORP

1A 21NOV77

GRAPHIC CONTROLS CORPORATION Buffalo, New York Printed in U.S.A.



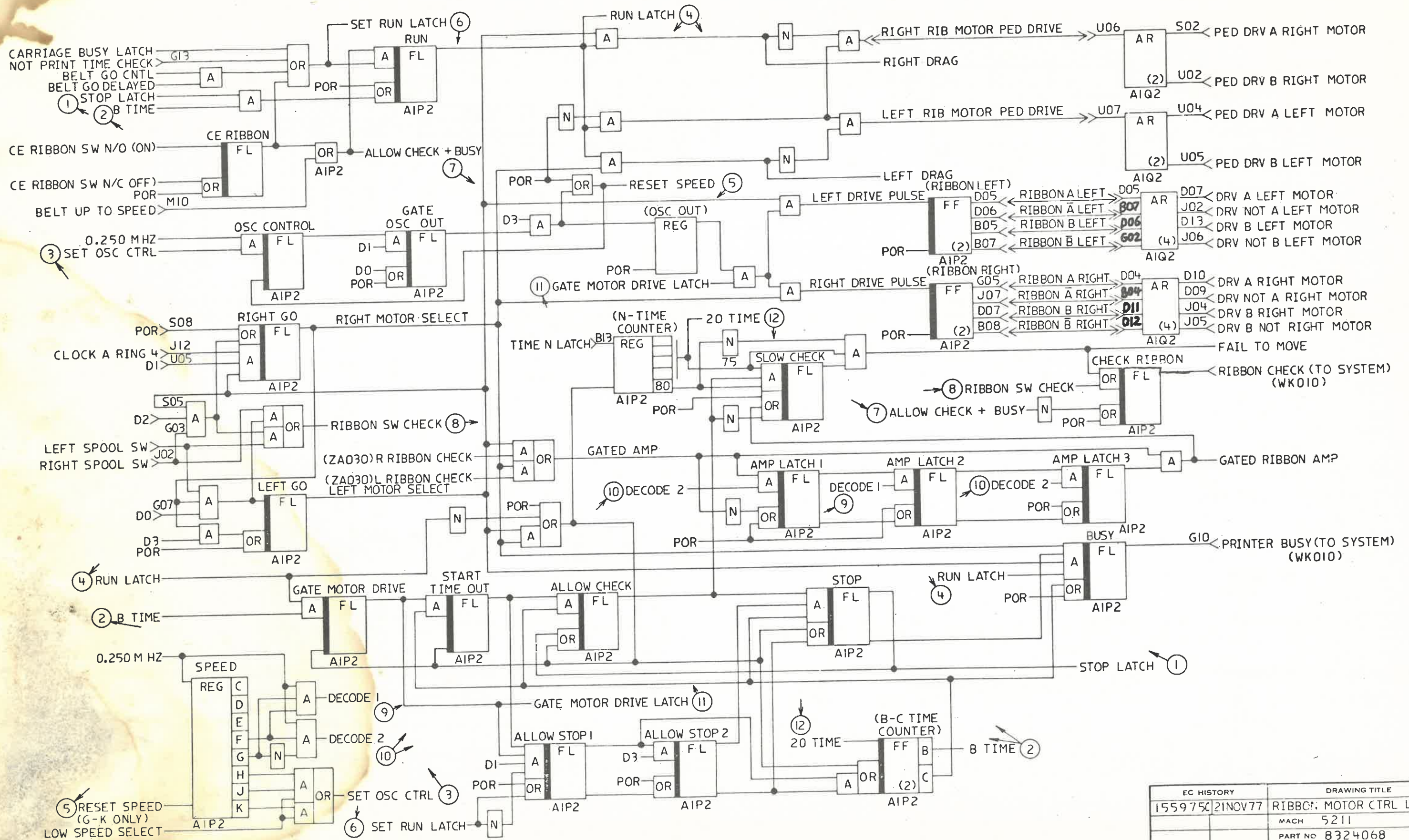


NOTE 1 PROBE POINTS IN PARENTHESES ARE FOR LEFT DRIVE

EC HISTORY		DRAWING TITLE	
15NOV77	155975C	RIBBON MOTOR CONTROL TIMING	
		MACH	5211
		PART NO 8324067	
C		CLASSIFICATION	IBM CORP

19055

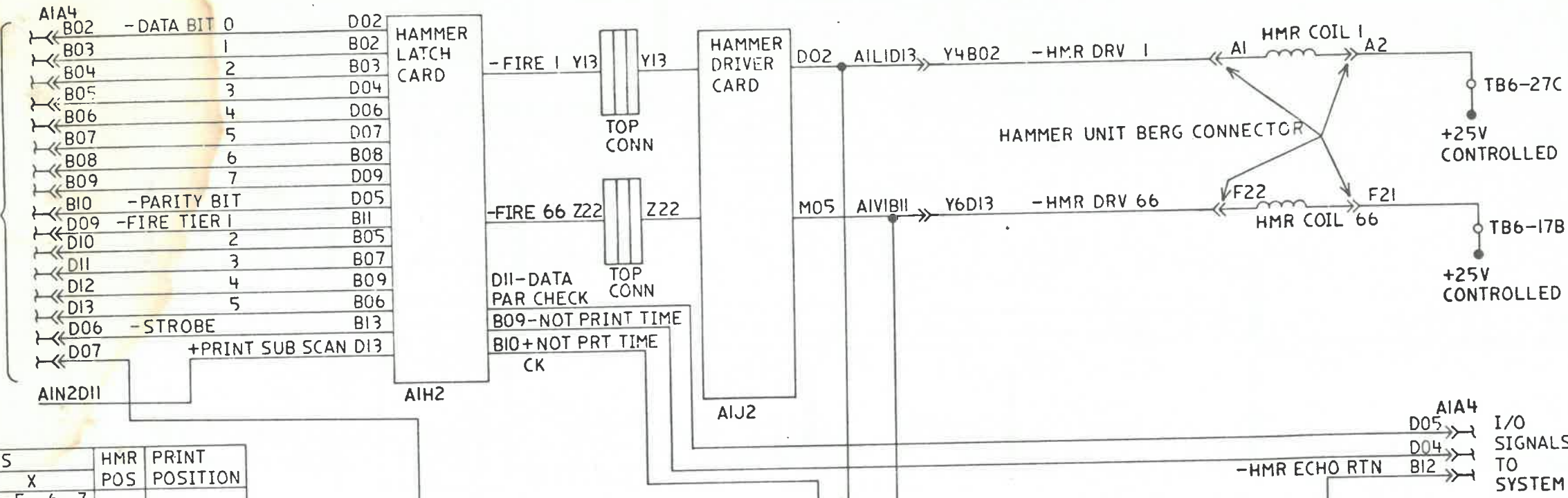
19055



EC HISTORY		DRAWING TITLE	
1559750	21NOV77	RIBBON MOTOR CTRL LOGIC	
		MACH 5211	
		PART NO 8324068	
		CLASSIFICATION	
		CORP	



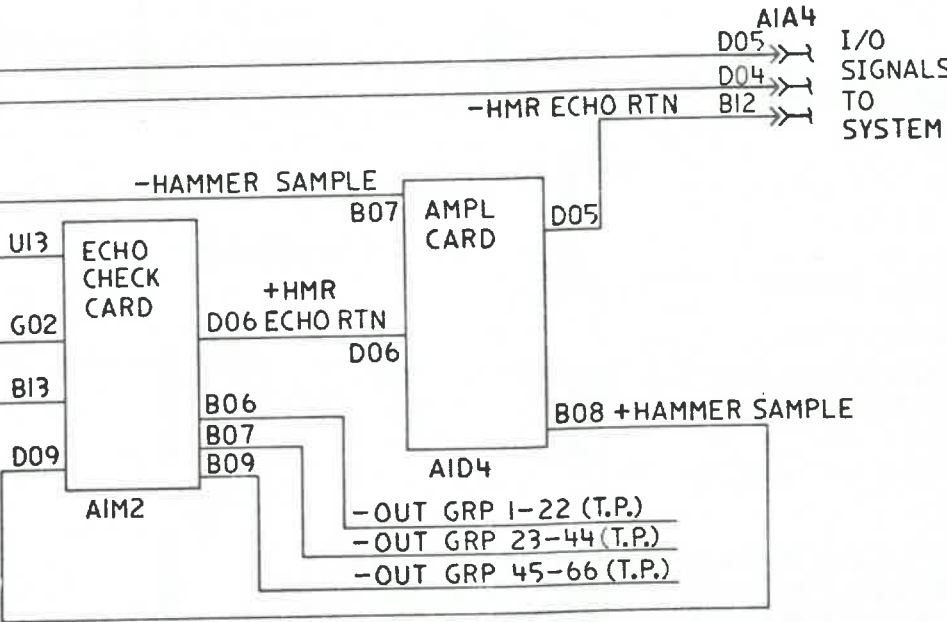
I/O SIGNALS FROM  
SYSTEM



DATA BITS								HMR POS	PRINT POSITION
Y	2	3	4	5	6	7	X		
0	1	2	3	4	5	6	7	1	1,2
+	+	+	+	+	+	+	+	2	3,4
+	+	+	+	+	+	+	+	3	5,6
+	+	+	+	+	+	+	+	4	7,8
+	+	+	+	+	+	+	+	5	9,10
+	+	+	+	+	+	+	+	6	11,12
+	+	+	+	+	+	+	+	7	13,14
+	+	+	+	+	+	+	+	8	15,16
+	+	+	+	+	+	+	+	9	17,18
+	+	+	+	+	+	+	+	10	19,20
+	+	+	+	+	+	+	+	11	21,22
+	+	+	+	+	+	+	+	12	23,24
+	+	+	+	+	+	+	+	13	25,26
+	+	+	+	+	+	+	+	14	27,28
+	+	+	+	+	+	+	+	15	29,30
+	+	+	+	+	+	+	+	16	31,32
+	+	+	+	+	+	+	+	32	63,64
+	+	+	+	+	+	+	+	48	95,96
+	+	+	+	+	+	+	+	64	127,128
+	+	+	+	+	+	+	+	65	129,130
+	+	+	+	+	+	+	+	66	131,132

X-Y DECODE FOR PRINT POSITIONS									
	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8
X0	1	17	33	49	65	81	97	113	129
	2	18	34	50	66	82	98	114	130
X2	3	19	35	51	67	83	99	115	131
	4	20	36	52	68	84	100	116	132
X4	5	21	37	53	69	85	101	117	
	6	22	38	54	70	86	102	118	
X6	7	23	39	55	71	87	103	119	
	8	24	40	56	72	88	104	120	
X8	9	25	41	57	73	89	105	121	
	10	26	42	58	74	90	106	122	
X10	11	27	43	59	75	91	107	123	
	12	28	44	60	76	92	108	124	
X12	13	29	45	61	77	93	109	125	
	14	30	46	62	78	94	110	126	
X14	15	31	47	63	79	95	111	127	
	16	32	48	64	80	96	112	128	

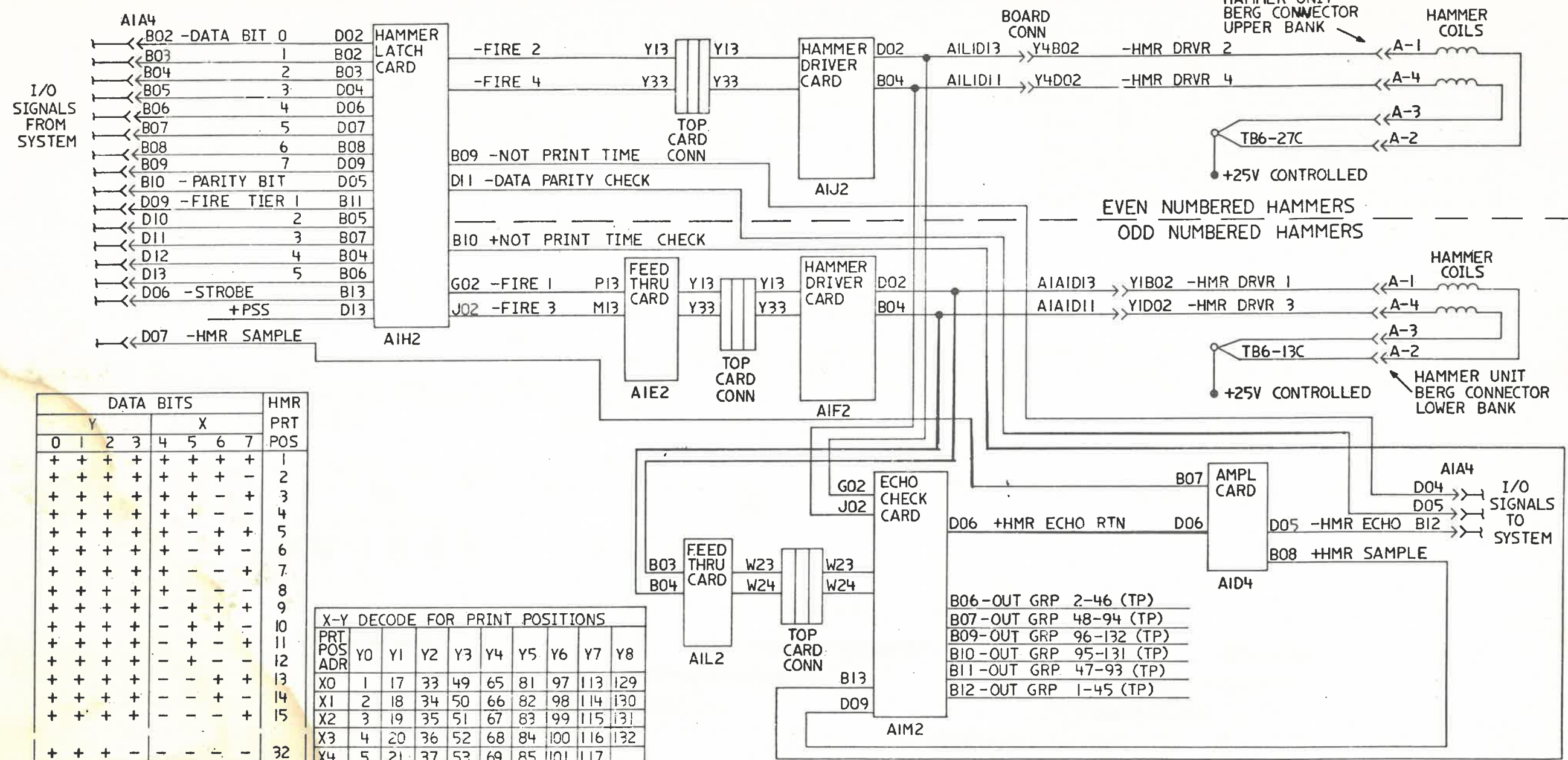
NOTE  
REFER TO LOGIC DIAGRAM SECTION 18 FOR  
POINT TO POINT WIRING OF EACH HAMMER COIL.



EC HISTORY		DRAWING TITLE	
15 NOV77	155975C	HAMMER CTRL DIAGRAM MODEL 1	
		MACH 5211 MODEL 1	
		PART NO 8324069	
C		CLASSIFICATION	IBM CORP

191065



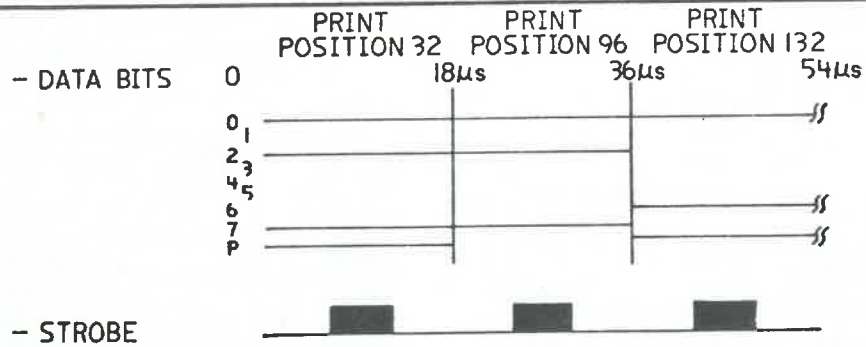
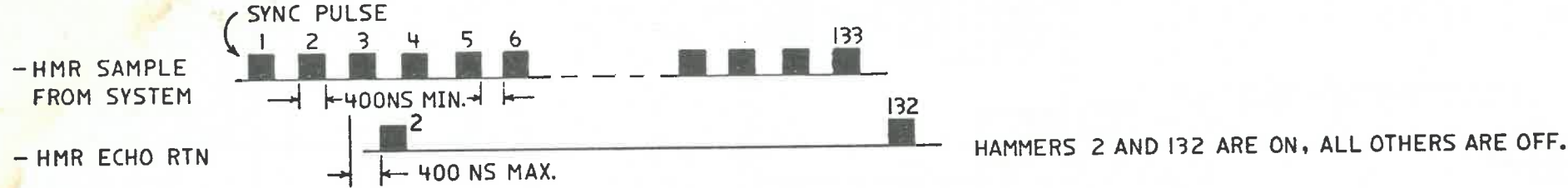
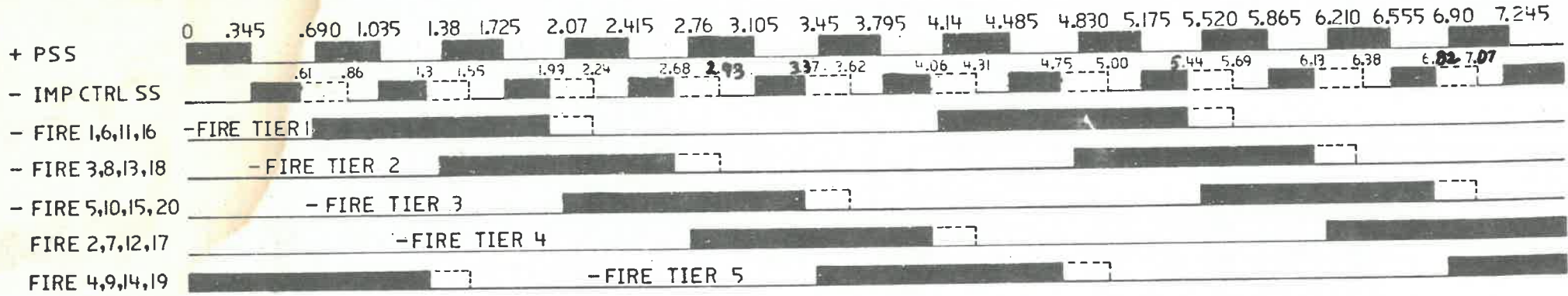


DATA BITS								HMR
Y				X				PRT
0	1	2	3	4	5	6	7	POS
+	+	+	+	+	+	+	+	1
+	+	+	+	+	+	+	-	2
+	+	+	+	+	+	-	+	3
+	+	+	+	+	+	-	-	4
+	+	+	+	+	-	+	+	5
+	+	+	+	+	-	+	-	6
+	+	+	+	+	-	-	+	7
+	+	+	+	+	-	-	-	8
+	+	+	+	-	+	+	+	9
+	+	+	+	-	+	+	-	10
+	+	+	+	-	+	-	+	11
+	+	+	+	-	+	-	-	12
+	+	+	+	-	-	+	+	13
+	+	+	+	-	-	+	-	14
+	+	+	+	-	-	-	+	15
+	+	+	-	-	-	-	-	32
+	+	-	+	-	-	-	-	48
+	+	-	-	-	-	-	-	64
+	-	+	+	-	-	-	-	80
+	-	+	-	-	-	-	-	96
+	-	-	+	-	-	-	-	112
+	-	-	-	-	-	-	-	128
-	+	+	+	-	-	-	-	132

X-Y DECODE FOR PRINT POSITIONS									
PRT POS ADR	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8
X0	1	17	33	49	65	81	97	113	129
X1	2	18	34	50	66	82	98	114	130
X2	3	19	35	51	67	83	99	115	131
X3	4	20	36	52	68	84	100	116	132
X4	5	21	37	53	69	85	101	117	
X5	6	22	38	54	70	86	102	118	
X6	7	23	39	55	71	87	103	119	
X7	8	24	40	56	72	88	104	120	
X8	9	25	41	57	73	89	105	121	
X9	10	26	42	58	74	90	106	122	
X10	11	27	43	59	75	91	107	123	
X11	12	28	44	60	76	92	108	124	
X12	13	29	45	61	77	93	109	125	
X13	14	30	46	62	78	94	110	126	
X14	15	31	47	63	79	95	111	127	
X15	16	32	48	64	80	96	112	128	

EC HISTORY		DRAWING TITLE	
15NOV77	155975C	HAMMER CONTROL DIAG. MODEL 2	
		MACH 5211 MODEL 2	
		PART NO 8324070	
C		CLASSIFICATION	IBM CORP

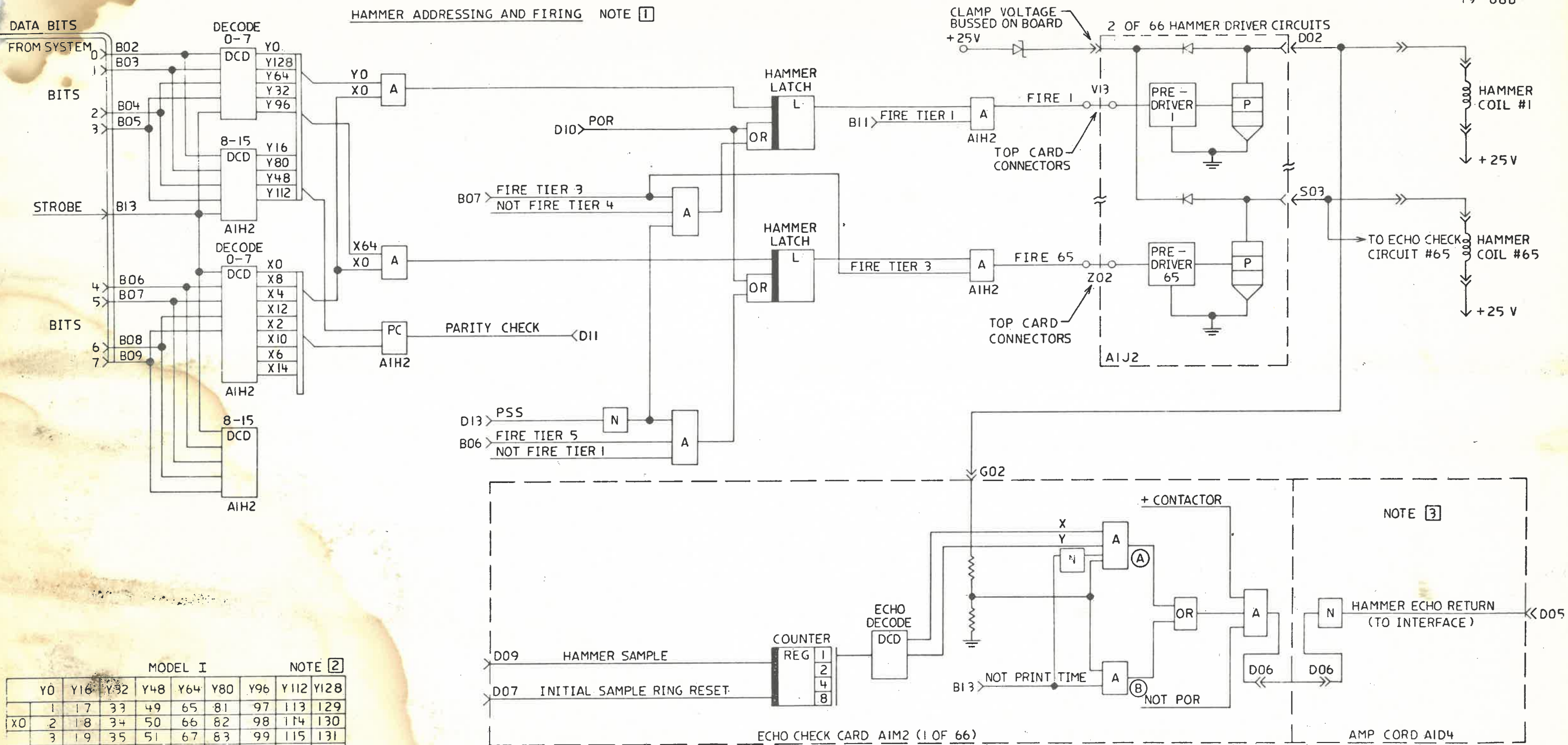
PRINT CONTROL TIMING (MODEL I & II)



DATA MUST BE ACTIVE .6μs BEFORE STROBE IS ACTIVE  
DATA MUST REMAIN ACTIVE .6μs AFTER STROBE IS ACTIVE  
STROBE PULSE WIDTH MUST BE .6μs  
TIME BETWEEN STROBE PULSES MUST BE 1.8μs  
ALL TIMINGS ARE MINIMUM

EC HISTORY		DRAWING TITLE	
15 NOV77	155975C	HAMMER CONTROL TIMING	
		MACH 5211	
		PART NO 8324071	
C		CLASSIFICATION	IBM CORP





MODEL I								NOTE ②	
	Y0	Y16	Y32	Y48	Y64	Y80	Y96	Y112	Y128
	1	17	33	49	65	81	97	113	129
X0	2	18	34	50	66	82	98	114	130
	3	19	35	51	67	83	99	115	131
X2	4	20	36	52	68	84	100	116	132
	5	21	37	53	69	85	101	117	
X4	6	22	38	54	70	86	102	118	
	7	23	39	55	71	87	103	119	
X6	8	24	40	56	72	88	104	120	
	9	25	41	57	73	89	105	121	
X8	10	26	42	58	74	90	106	122	
	11	27	43	59	75	91	107	123	
X10	12	28	44	60	76	92	108	124	
	13	29	45	61	77	93	109	125	
X12	14	30	46	62	78	94	110	126	
	15	31	47	63	79	95	111	127	
X14	16	32	48	64	80	96	112	128	

## NOTES

- 1 THIS DIAGRAM IS FOR EASE OF UNDERSTANDING THE MODEL I , IN POSITIVE LOGIC .  
IT DOES NOT REPRESENT ACTUAL LOGIC
- 2 THIS CHART REPRESENTS THE ACTUAL HAMMER DECODE LINES
- 3
  - (A) ANY HAMMER ON CHECK - AN OUTPUT WHEN NOT PRINT TIME
  - (B) HAMMER ECHO CHECK - ANY INCORRECT OUTPUT DURING PRINT TIME

D	EC HISTORY	DRAWING TITLE
	155975016NOV77	HAMMER CONTROL LOGIC
		MACH 5211
		PART NO 8324072
		CLASSIFICATION
		ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED
		DATE 01-11-2001 BY 60322 UCBAW
		FOR RELEASE UNDER E.O. 13526













**Maintenance Library**



**Printer  
Parts Catalog**

## **Preface**

This Parts Catalog (PC) contains listings and illustrations of all replaceable assemblies, subassemblies and detail parts released on or before February 1, 1978..

This Parts Catalog is Section 20 of the *S211 Maintenance Information Manual* and uses 20 as a prefix for page numbering.

### ***Second Edition (March 1978)***

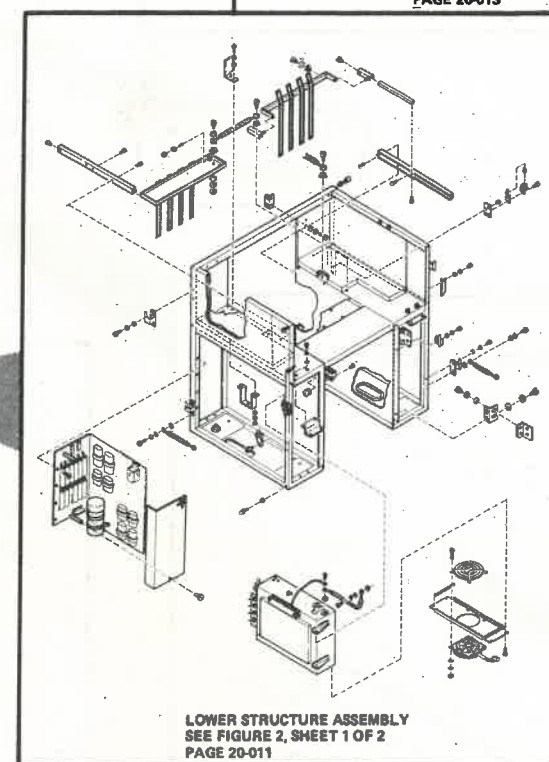
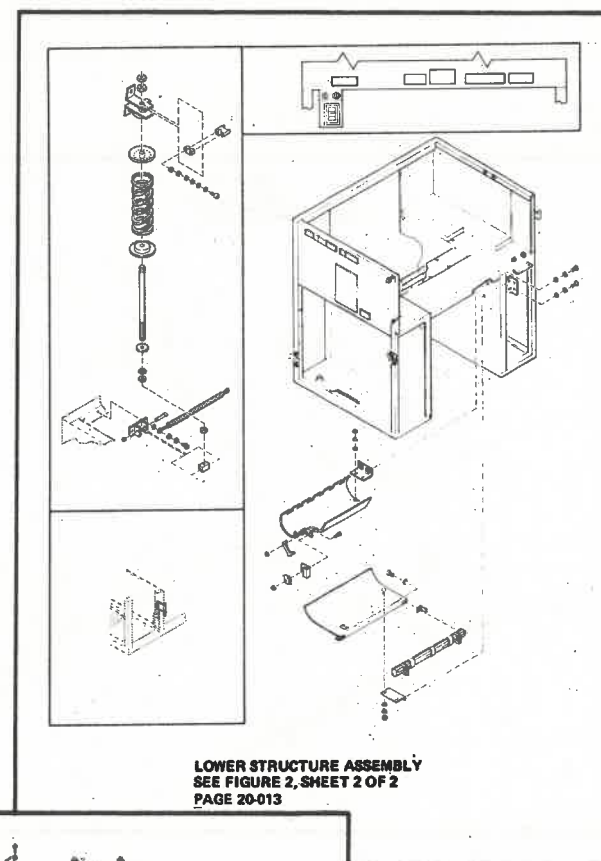
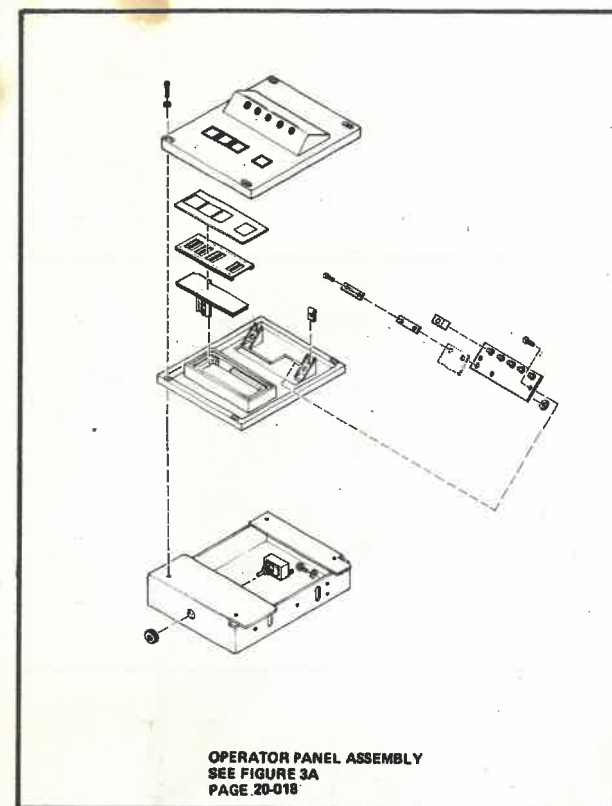
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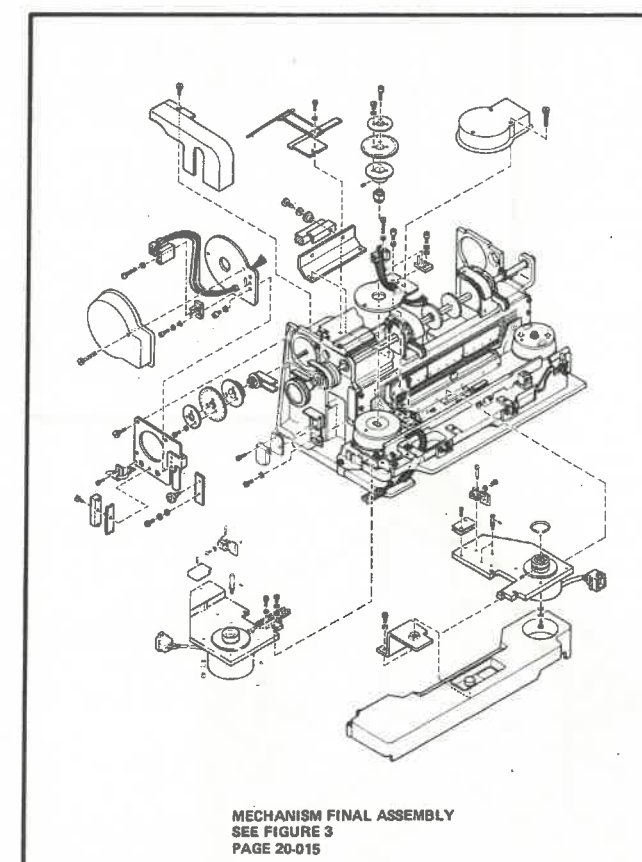
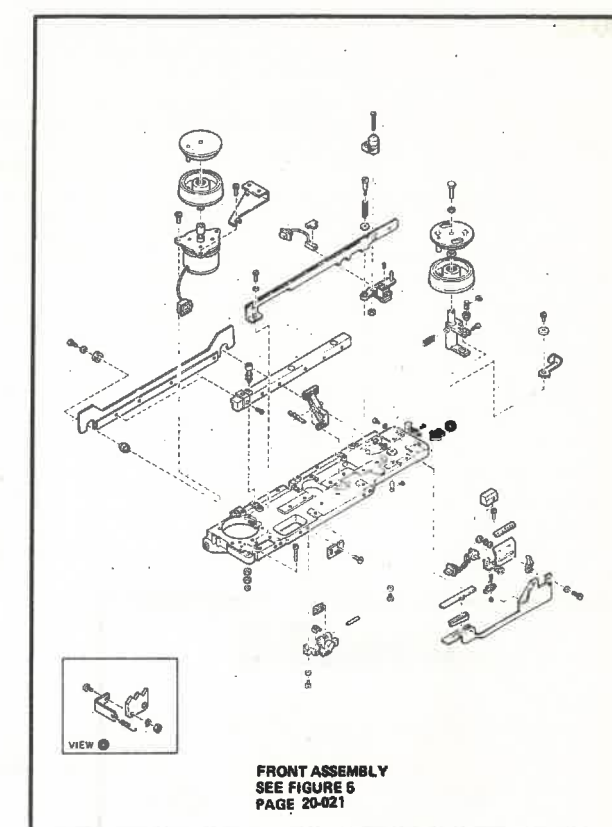
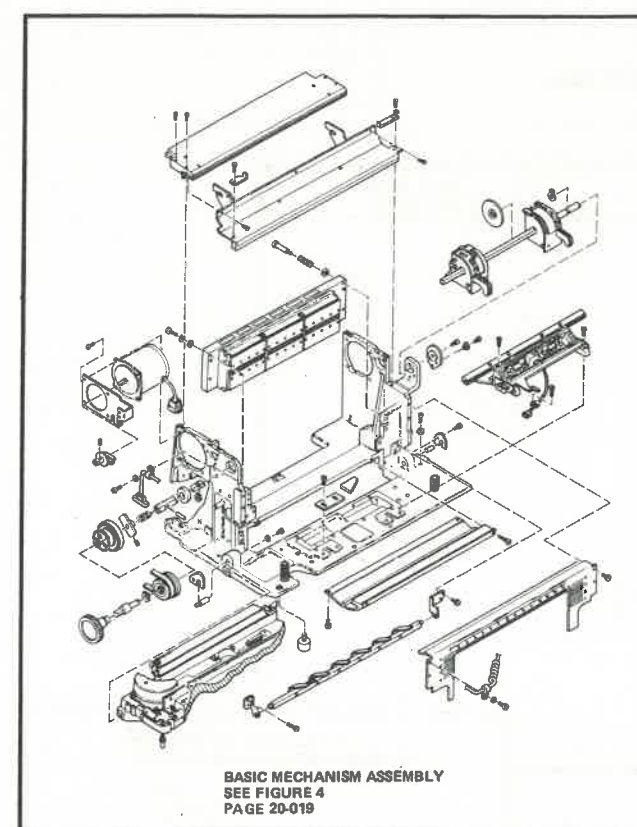
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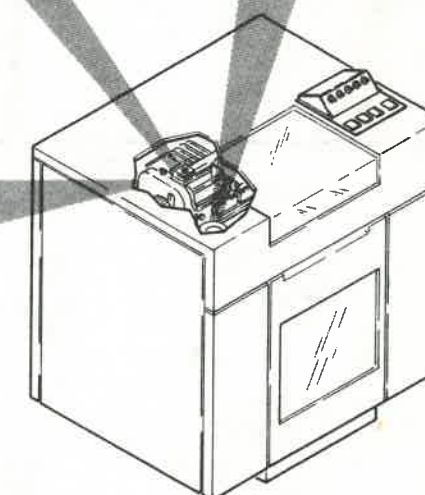
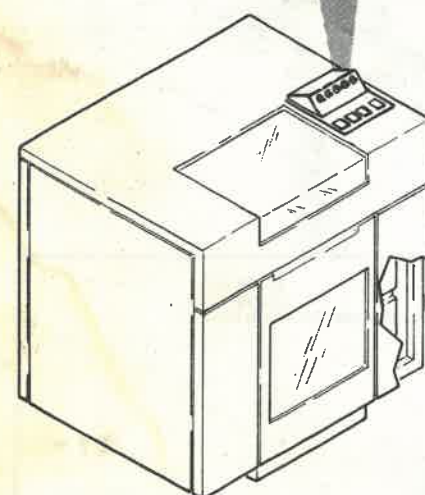
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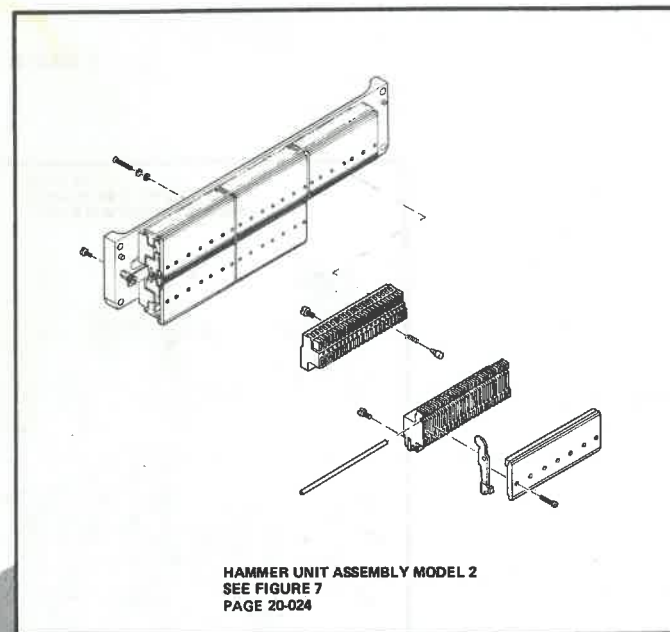
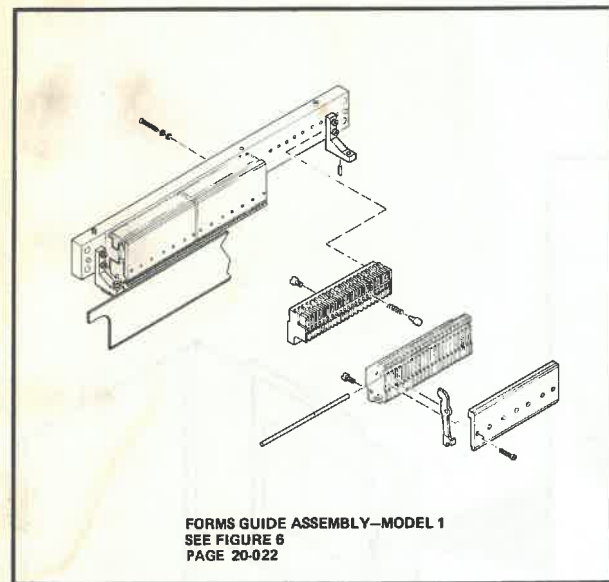
VISUAL INDEX 3



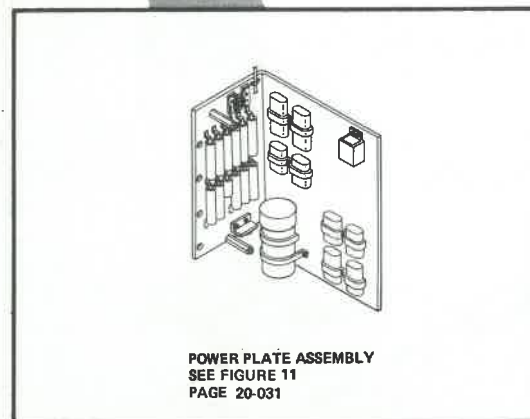
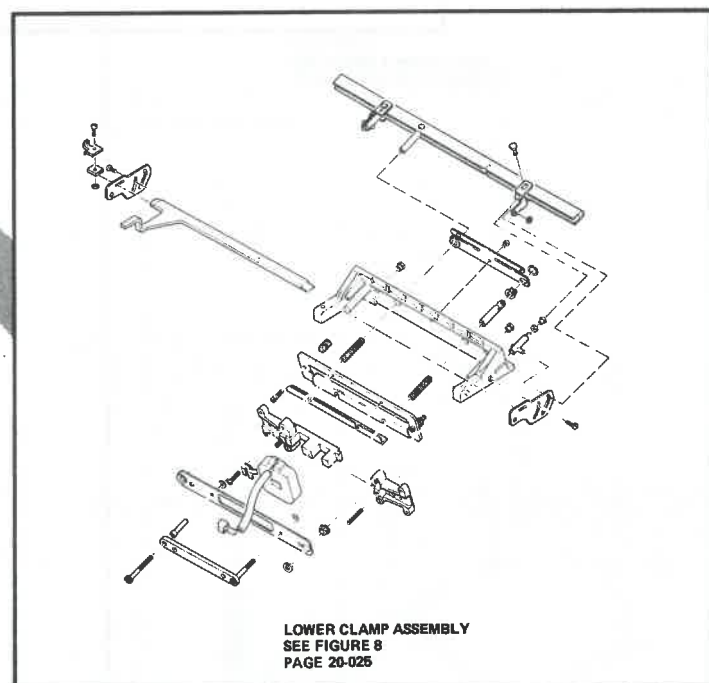
VISUAL INDEX 4



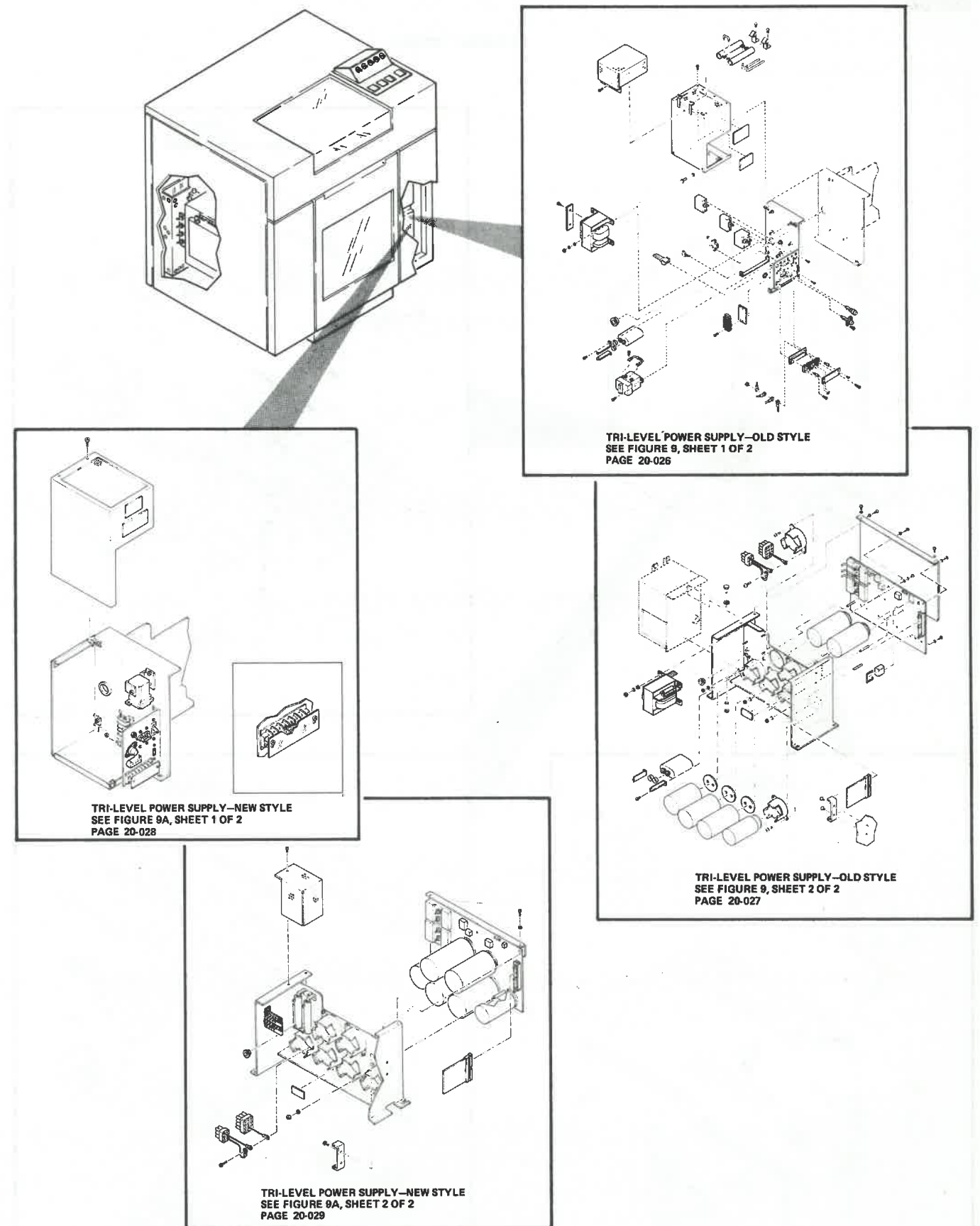




CABLE ASSEMBLIES  
WITH COMPONENT PARTS  
SEE FIGURE 12  
PAGE 20-033



VISUAL INDEX 5



VISUAL INDEX 6



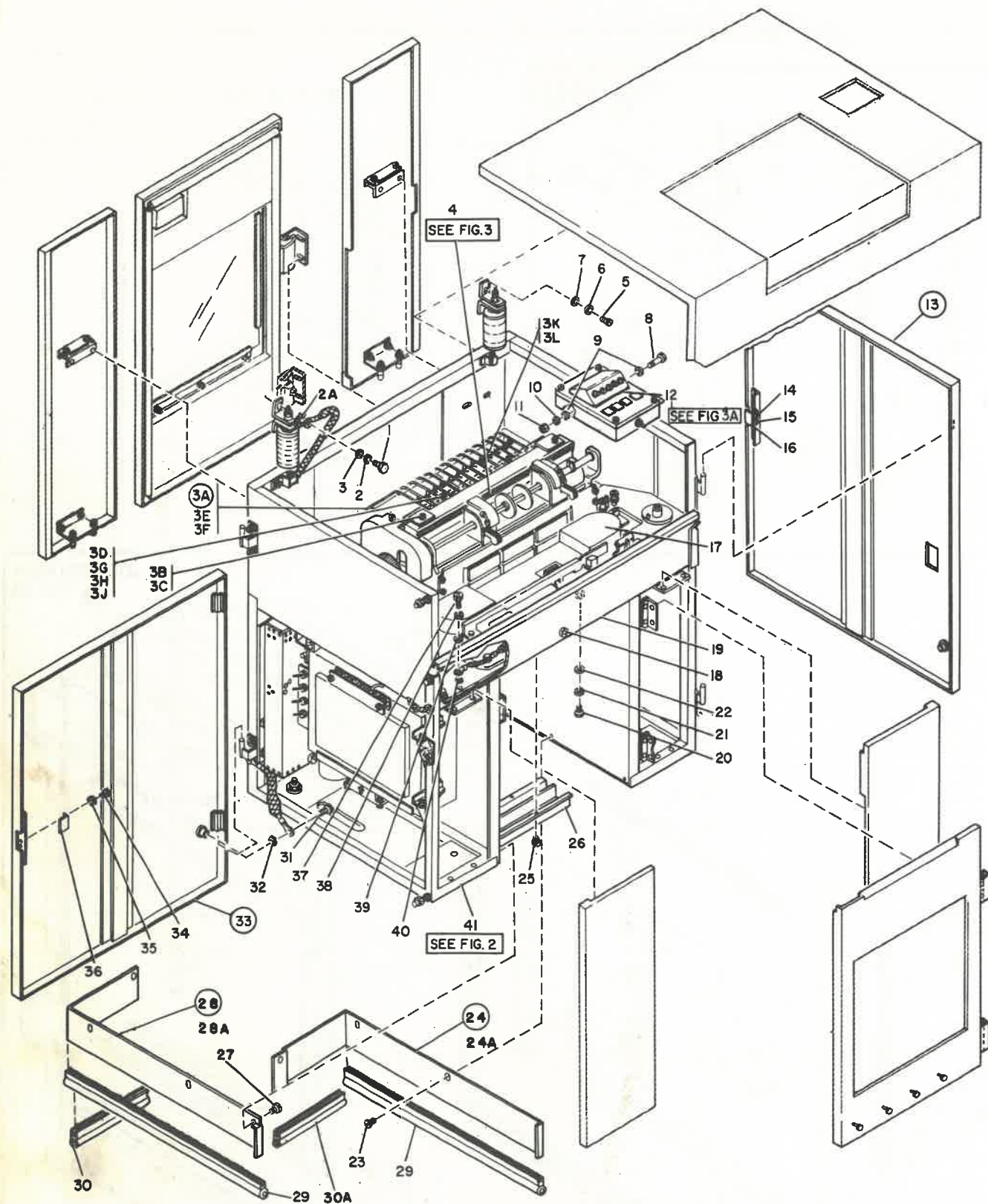


FIGURE 1. FINAL ASSEMBLY. SHEET 1 OF 5. INDEX NOS. 1-41 SEE LIST 1.

# FINAL ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
1 -	4135002	1	FINAL ASSEMBLY, MODEL 1
-	1815100	1	FINAL ASSEMBLY, MODEL 2
- 1	120211	1	FOR ILLUSTRATION SEE FIGURE 1
- 2	9092	1	SCREW, HEX HD- 10-32 X 0.500 LG
- 2A	56079	1	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 3	1940	1	LOCKWASHER, EXT TEETH- 0.204 ID X 0.410 O
- 3A	5593466	1	WASHER, FLAT- 0.192 ID X 0.562 OD
- 3B	34512	1	GUIDE ASM, UPPER
- 3C	22478	2	SCREW, BD HD- 8-32 X 0.375 LG
- 3D	119	2	WASHER, FL- 0.170 ID X 0.375 OD
- 3E	1815105	1	SCREW, MACH FL CSK HD- 8-32 X 0.500 LG
- 3F	5593465	1	GUIDE, UPPER
- 3G	22478	1	COVER
- 3H	1090873	2	WASHER, FL- 0.170 ID X 0.375 OD
- 3J	257189	2	LOCKWASHER, SPLIT- 0.168 ID X 0.296 OD
- 3K	850248	1	NUT, HEX- 8-32
- 3L	236849	1	TINSEL
- 4	1808563	2	SCREW, BD HD- 10-32 X 0.250 LG
- 4	1808564	1	MECHANISM FINAL ASSEMBLY, MODEL 1
- 4	1808564	1	FOR DETAIL BREAKDOWN SEE FIGURE 3
- 4	1808564	1	MECHANISM FINAL ASSEMBLY, MODEL 2
- 4	1808564	1	FOR DETAIL BREAKDOWN SEE FIGURE 3
- 5	130434	3	SCREW, SLOTTED HEX HD 10-32 X 0.375 LG
- 6	9092	3	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 7	1940	3	WASHER, FLAT- 0.192 ID X 0.562 OD
- 8	36112	2	SCREW, SLOTTED HEX HC- 1/4-20 X 1.500 LG
- 9	3550	4	WASHER, FL- 0.250 ID X 0.562 OD
- 10	6935	2	LOCKWASHER, SPLIT- 0.250 ID X 0.493 OD
- 11	36109	2	NUT, HEX- 1/4-20
- 12	5593448	1	OPERATOR PANEL
- 12	5593448	1	FOR DETAIL BREAKDOWN SEE FIGURE 3A
- 13	4135007	1	COVER ASM, BLUE
- 13	5576650	1	COVER ASM, RED
- 13	5576652	1	COVER ASM, GREY
- 13	5576654	1	COVER ASM, YELLOW
- 14	58207	4	SCREW, BD HD- 8-32 X 0.250 LG
- 15	185116	4	WASHER
- 16	833697	2	STRIKE
- 17	5576666	1	COVER ASM
- 18	637733	1	SCREW, SEM HEX HD- 10-32 X 0.465 LG
- 19	4138367	1	PLATE ASM
- 20	38686	4	SCREW, HEX HD- 1/4-20 X 0.500 LG
- 21	6935	4	LOCKWASHER, SPLIT- 0.250 ID X 0.493 OD
- 22	3550	4	WASHER, FL- 0.250 ID X 0.562 OD
- 23	236849	4	SCREW, BD HD- 10-32 X 0.250 LG
- 24	6808567	1	SKIRT ASSEMBLY
- 24A	4134960	1	SKIRT
- 25	332620	6	SCREW, BD HD- 10-32 X 0.500 LG
- 26	1819764	1	CHANNEL
- 27	236849	3	SCREW, BD HD- 10-32 X 0.250 LG
- 28	6808568	1	SKIRT ASSEMBLY
- 28A	4134959	1	SKIRT
- 29	4138390	1	SEAL
- 30	4138398	1	SEAL
- 30A	6808566	1	SEAL
- 31	236849	2	SCREW, BD HD- 10-32 X 0.250 LG
- 32	56079	2	LOCKWASHER, EXT TEETH- 0.204 ID X 0.410 O
- 33	4135007	2	COVER ASM, BLUE
- 33	5576650	1	COVER ASM, RED
- 33	5576652	1	COVER ASM, GREY
- 33	5576654	1	COVER ASM, YELLOW
- 34	58207	4	SCREW, BD HD- 8-32 X 0.250 LG
- 35	185116	4	WASHER
- 36	833697	2	STRIKE
- 37	120211	1	SCREW, HEX HD- 10-32 X 0.500 LG
- 38	9092	1	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 39	1940	1	WASHER, FLAT- 0.192 ID X 0.562 OD
- 40	56079	4	LOCKWASHER, EXT TEETH- 0.20 ID X 0.41 OD
- 41	1815055	1	LOWER STRUCTURE ASSEMBLY
- 41	1815055	1	FOR DETAIL BREAKDOWN SEE FIGURE 2

ATT PT

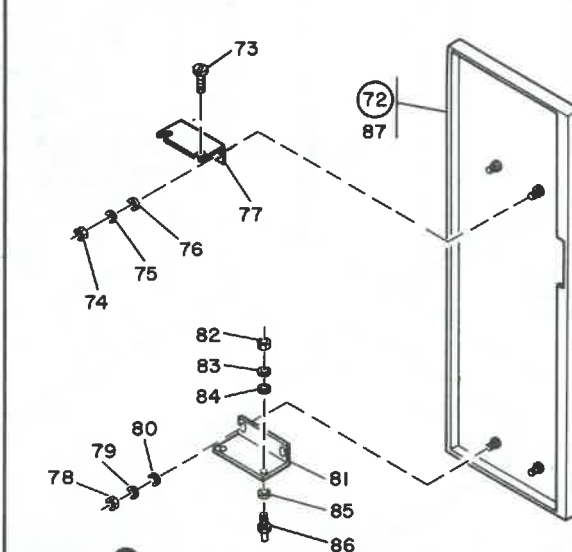
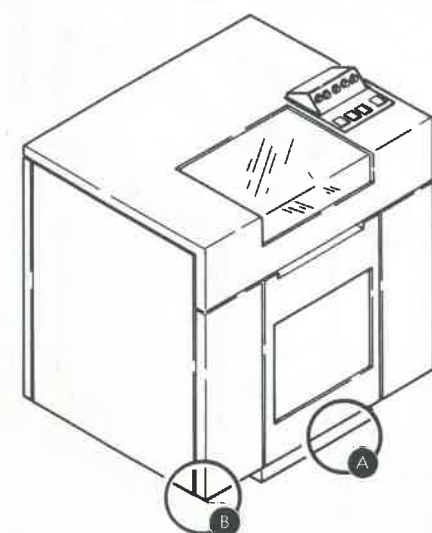
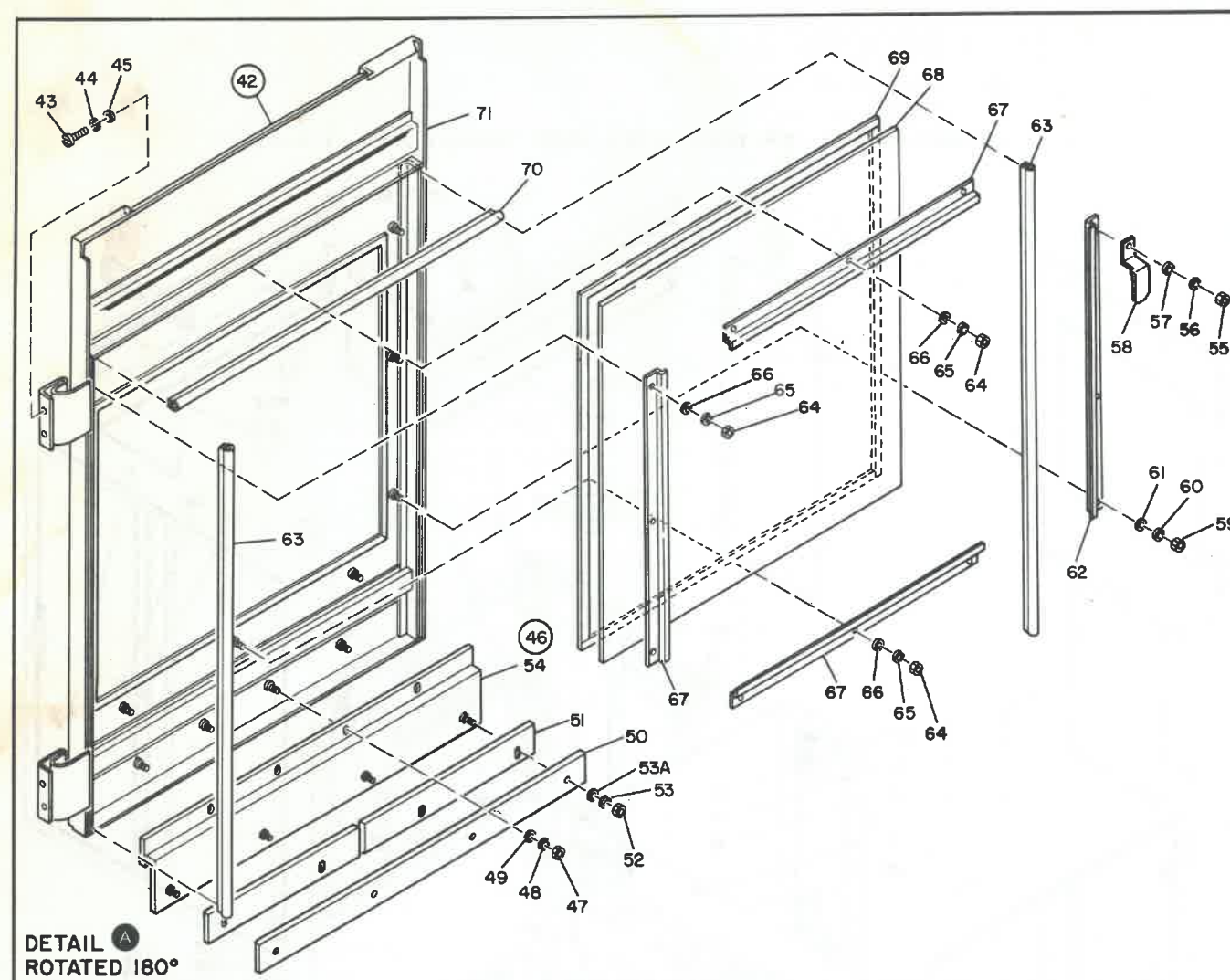


FIGURE 1. FINAL ASSEMBLY. SHEET 2 OF 5. INDEX NOS. 42-87SEE LIST 1.

# FINAL ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	1 2 3 4	DESCRIPTION
1 - 42	4138346	1	1	DOOR ASM
- 43	130434	4	2	SCREW, SLOTTED HEX HI 10-32 X 0.375 LG
- 44	9092	4	3	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 45	1940	4	4	WASHER, FLAT- 0.192 ID X 0.562 OD
- 46	6808569	1	1	SKIRT ASM
- 47	11598	4	2	NUT, HEX- 10-32
- 48	9092	4	3	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 49	1940	4	4	WASHER, FLAT- 0.192 ID X 0.562 OD
- 50	4135082	1	1	PLATE
- 51	4135127	2	2	PAD
- 52	11598	4	2	NUT, HEX- 10-32
- 53	9092	4	3	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 53A	1940	4	4	WASHER, FLAT- 0.192 ID X 0.562 OD
- 54	1819773	1	1	BRACKET
- 55	11598	1	2	NUT, HEX- 10-32
- 56	1940	1	3	WASHER, FLAT- 0.192 ID X 0.562 OD
- 57	9092	1	4	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 58	5576638	1	1	STRIKE
- 59	11598	2	2	NUT, HEX- 10-32
- 60	45690	2	3	WASHER, FL- 0.203 ID X 0.438 OD
- 61	9092	2	4	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 62	4138349	1	1	CLAMP
- 63	2526535	2	2	SEAL, 72 INCHES LG
- 64	11598	9	3	NUT, HEX- 10-32
- 65	45690	9	4	WASHER, FL- 0.203 ID X 0.438 OD
- 66	9092	9	1	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 67	4138349	3	2	CLAMP
- 68	1815113	1	1	GLASS
- 69	4138391	1	1	SEAL
- 70	2526535	1	1	SEAL, 72 INCHES LG
- 71	4138347	1	1	DOOR
- 72	557669	1	1	COVER ASSEMBLY, LEFT FRONT
- 73	32042	2	2	SCREW, BD HD- 10-32 X 0.375 LG
- 74	11598	2	3	NUT, HEX- 10-32
- 75	9092	2	4	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 76	1940	2	1	WASHER, FLAT- 0.192 ID X 0.562 OD
- 77	4138371	1	1	BRACKET
- 78	11598	2	2	NUT, HEX- 10-32
- 79	9092	2	3	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 80	1940	2	4	WASHER, FLAT- 0.192 ID X 0.562 OD
- 81	1819763	1	1	BRACKET
- 82	11598	2	2	NUT, HEX- 10-32
- 83	9092	2	3	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 84	1940	2	4	WASHER, FLAT- 0.192 ID X 0.562 OD
- 85	1940	2	1	WASHER, FLAT- 0.192 ID X 0.562 OD
- 86	474405	2	2	FIN
- 87	1815117	1	1	COVER



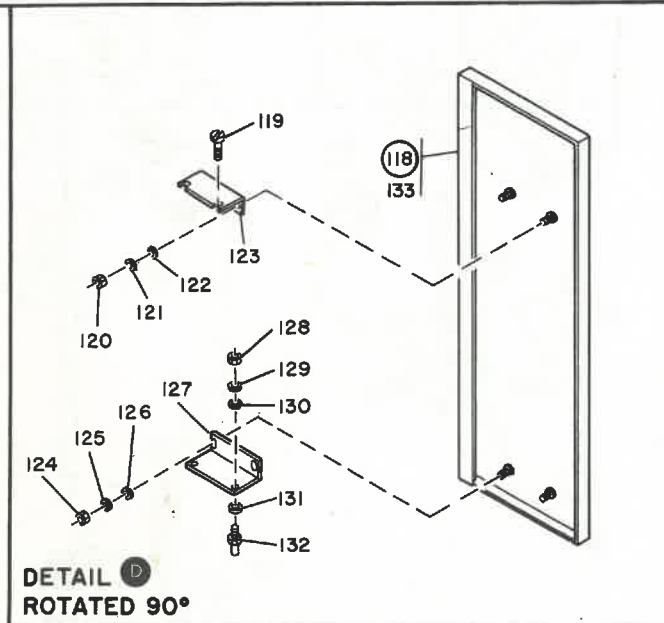
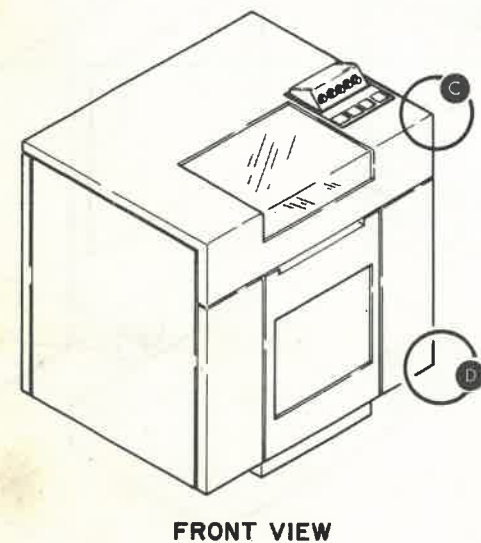
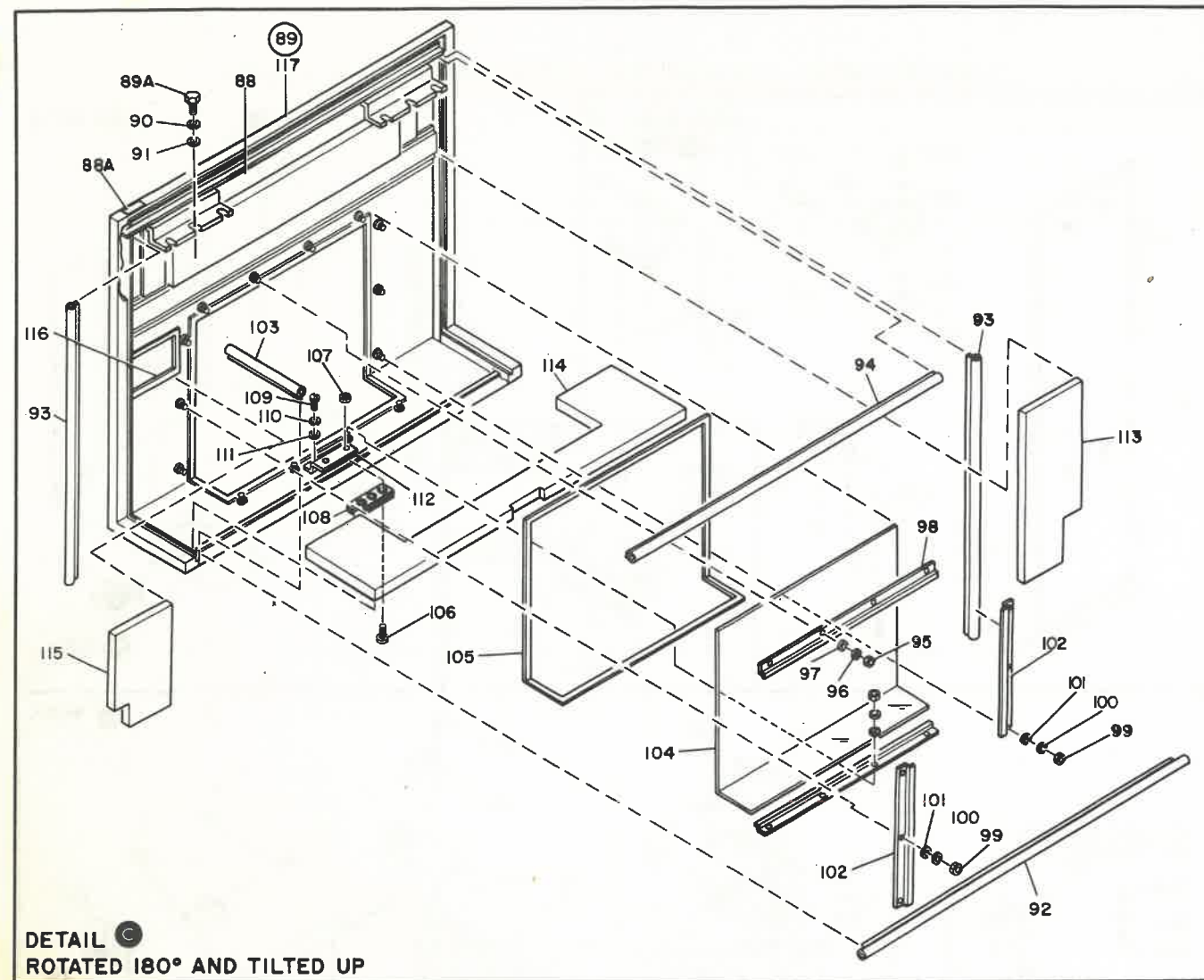


FIGURE 1. FINAL ASSEMBLY. SHEET 3 OF 5. INDEX NOS. 88-133. SEE LIST 1.

FINAL ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	1	2	3	4	DESCRIPTION
1 - 88	8330332	1	.	.	.	.	PAD
- 88A	911932	1	.	.	.	.	LABEL
- 89	4138339	1	.	.	.	.	COVER ASM, TOP
- 89A	38686	6	.	.	.	.	SCREW, HEX HD- 1/4-20 X 0.500 LG
- 90	6935	6	.	.	.	.	LOCKWASHER, SPLIT- 0.250 ID X 0.493 OD
- 91	3550	6	.	.	.	.	WASHER, FL- 0.250 ID X 0.562 OD
- 92	2526535	2	.	.	.	.	SEAL, 72 INCHES LG
- 93	2526535	2	.	.	.	.	SEAL, 72 INCHES IG
- 94	2526535	2	.	.	.	.	SEAL, 72 INCHES LG
- 95	11598	8	.	.	.	.	NUT, HEX- 10-32
- 96	9092	8	.	.	.	.	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 97	45690	8	.	.	.	.	WASHER, FL- 0.203 ID X 0.438 OD
- 98	4138394	2	.	.	.	.	CLAMP
- 99	11598	6	.	.	.	.	NUT, HEX- 10-32
- 100	9092	6	.	.	.	.	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 101	45690	6	.	.	.	.	WASHER, FL- 0.203 ID X 0.438 OD
- 102	4138345	2	.	.	.	.	CLAMP
- 103	2526535	2	.	.	.	.	SEAL, 72 INCHES IG
- 104	4138341	1	.	.	.	.	GLASS
- 105	4138391	1	.	.	.	.	SEAL
- 106	438552	2	.	.	.	.	SCREW, MACH BD HD- 4-40 X 0.750 LG
- 107	37913	2	.	.	.	.	NUT, HEX- 0.375-16
- 108	848876	1	.	.	.	.	LATCH ASM, COVER
- 109	32042	2	.	.	.	.	SCREW, BD HD- 10-32 X 0.375 LG
- 110	9092	2	.	.	.	.	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 111	45690	2	.	.	.	.	WASHER, FL- 0.203 ID X 0.438 OD
- 112	6808521	1	.	.	.	.	BRACKET ASM
- 113	4138344	1	.	.	.	.	CHANNEL
- 114	4138342	1	.	.	.	.	CHANNEL
- 115	4138343	1	.	.	.	.	MAT
- 116	6808599	1	.	.	.	.	SEAL
- 117	4138340	1	.	.	.	.	COVER
- 118	5576670	1	.	.	.	.	COVER ASM, RIGHT FRONT
- 119	32042	2	.	.	.	.	SCREW, BD HD- 10-32 X 0.375 LG
- 120	11598	2	.	.	.	.	NUT, HEX- 10-32
- 121	9092	2	.	.	.	.	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 122	1940	2	.	.	.	.	WASHER, FLAT- 0.192 ID X 0.562 OD
- 123	4138371	1	.	.	.	.	BRACKET
- 124	11598	2	.	.	.	.	NUT, HEX- 10-32
- 125	9092	2	.	.	.	.	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 126	1940	2	.	.	.	.	WASHER, FLAT- 0.192 ID X 0.562 OD
- 127	1819763	1	.	.	.	.	BRACKET
- 128	11598	2	.	.	.	.	NUT, HEX- 10-32
- 129	9092	2	.	.	.	.	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 130	1940	2	.	.	.	.	WASHER, FLAT- 0.192 ID X 0.562 OD
- 131	1940	2	.	.	.	.	WASHER, FLAT- 0.192 ID X 0.562 OD
- 132	474405	2	.	.	.	.	PIN
- 133	1815119	1	.	.	.	.	COVER

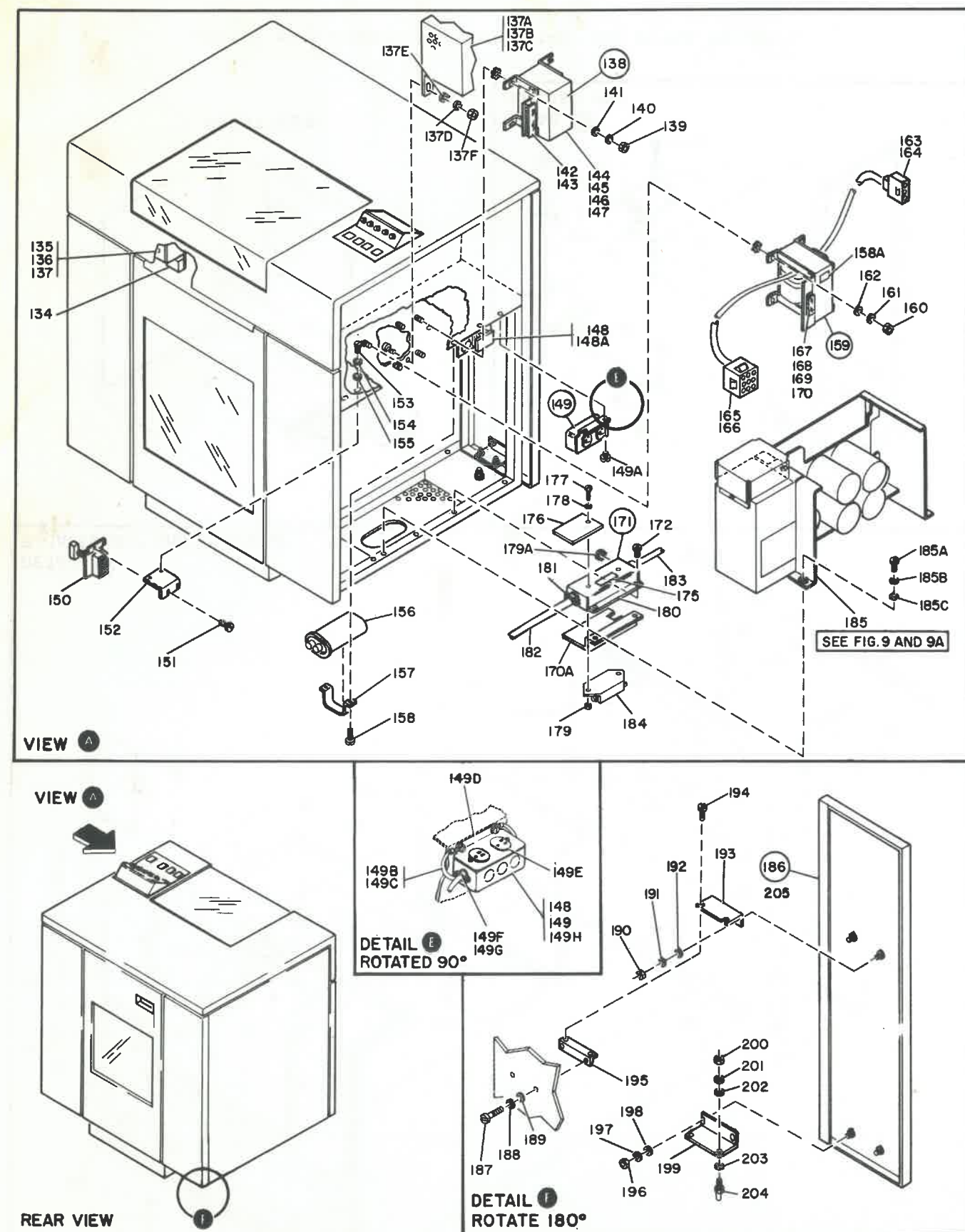


FIGURE 1. FINAL ASSEMBLY. SHEET 4 OF 5. INDEX NOS. 134-205. SEE LIST 1.

# FINAL ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	1 2 3 4	DESCRIPTION
1 -134	5576696	1	1	STRIKE
-135	38381	2	2	SCREW, FIL HD- 10-32 X 0.312 LG
-136	9092	2	2	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-137	1940	2	2	WASHER, FLAT- 0.192 ID X 0.562 OD
-137A	6808593	1	1	COVER ASM
-137B	2180701	1	1	SCREW
-137C	130434	2	2	SCREW, SLOTTED HEX HD 10-32 X 0.375 LG
-137D	9092	3	3	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-137E	1940	3	3	WASHER, FLAT- 0.192 ID X 0.562 OD
-137F	11598	1	1	NUT, HEX- 10-32
-138	6808518	1	1	TRANSFORMER ASM- 50/60 HZ
-138	6808585	1	1	TRANSFORMER ASM- 50 HZ
-139	11598	4	4	NUT, HEX- 10-32
-140	9092	4	4	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-140A	56079	1	1	LOCKWASHER, EXT TEETH- 0.204 ID X 0.410 O
-141	1940	4	4	WASHER, FLAT- 0.192 ID X 0.562 OD
-142	10170	2	2	SCREW, BD HD- 6-32 X 0.250 LG
-143	337193	1	1	SHIELD, TERMINAL BOARD 6 POSITION
-144	322550	2	2	SCREW, BD HD- 6-32 X 0.500 LG
-145	322266	1	1	STRIP, MARKER, 6 POS NOS.
-146	317131	1	1	BLOCK
-147	210883	2	2	STUD
-148	6808578	1	1	BRACKET ASM
-148A	332620	2	2	SCREW, BD HD- 10-32 X 0.500 LG
-149	5576641	1	1	OUTLET ASM
-149A	332620	2	2	SCREW, BD HD- 10-32 X 0.500 LG
-149B	1993977	1	1	JUMPER ASM
-149C	236849	2	2	SCREW, BD HD- 10-32 X 0.250 LG
-149D	4703239	1	1	BRACKET
-149E	357995	1	1	OUTLET, CONV 115V 60 HZ
-149F	151598	1	1	CLAMP
-149G	38443	2	2	SCREW, FL CSK HD- 6-32 X 0.312 LG
-149H	1993937	1	1	JUMPER ASM
-150	4138327	1	1	SWITCH ASM
-151	236849	2	2	SCREW, BD HD- 10-32 X 0.250 LG
-152	5576642	1	1	BRACKET
-153	130434	2	2	SCREW, SLOTTED HEX HD 10-32 X 0.375 LG
-154	9092	2	2	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-155	1940	2	2	WASHER, FLAT- 0.192 ID X 0.562 OD
-156	5252841	1	1	CAPACITOR
-157	1145820	1	1	BRACKET
-158	5644	2	2	SCREW, FL HD- 6-32 X 0.625 LG
-158A	2582954	1	1	LABEL
-159	5593446	1	1	TRANSFORMER ASM, FERRO- 60 HZ
-159	4119618	1	1	TRANSFORMER ASM, FERRO- 50 HZ
-160	11598	4	4	NUT, HEX- 10-32
-161	9092	4	4	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-161A	56079	1	1	LOCKWASHER, EXT TEETH- 0.204 ID X 0.410 O
-162	1940	4	4	WASHER, FLAT- 0.192 ID X 0.562 OD
-163	1847536	1	1	CONNECTOR, 15 POSITION
-164	1471028	3	3	CONTACT
-165	1847532	1	1	CONNECTOR
-166	1471028	6	6	CONTACT
-167	322550	2	2	SCREW, BD HD- 6-32 X 0.500 LG
-168	740554	1	1	STRIP
-169	317310	1	1	BLOCK, 5 DBL SCREW TERMINAL
-170	210883	2	2	STUD
-170A	4703256	1	1	PLATE ASM
-171	5576677	1	1	LINE FILTER ASM 60HZ
-171	6808547	1	1	LINE FILTER ASM 60 HZ 6 FOOT CORD
-171	5576679	1	1	LINE FILTER ASM 50HZ
-172	34512	2	2	SCREW, BD HD- 8-32 X 0.375 LG
-175	183755	1	1	LABEL
-176	4703232	1	1	PLATE
-177	186758	2	2	SCREW, BD HD- 8-32 X 0.437 LG
-178	1090873	2	2	LOCKWASHER, SPLIT- 0.168 ID X 0.296 OD
-179	257189	2	2	NUT, HEX- 8-32
-179A	850065	1	1	PLUG BUTTON-USED ON 6808547 FILTER ASM
-180	5576663	1	1	COVER, FILTER
-181	151598	2	2	CLAMP
-182	4138338	1	1	CABLE ASM 50-60HZ
-183	1819739	1	1	FOR COMPONENT PARTS SEE FIGURE 12
-183	4135130	1	1	CABLE ASM 60HZ
-183	5576678	1	1	FOR COMPONENT PARTS SEE FIGURE 12
-183	5576678	1	1	CABLE ASM 60 HZ-USED ON 6808547 FILTER
-183	5576678	1	1	FOR COMPONENT PARTS SEE FIGURE 12
-183	5576678	1	1	CABLE ASM 50HZ



FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
1			FOR COMPONENT PARTS SEE FIGURE 12			
-184	1862655	1	. . FILTER			
-185	4138414	1	. TRI-LEVEL POWER SUPPLY ASM 60HZ			
-185	4138420	1	. TRI-LEVEL POWER SUPPLY ASM 50HZ			
			FOR DETAIL BREAKDOWN SEE FIGURE 9			
-185	5593470	1	. TRI-LEVEL POWER SUPPLY 50/60 HZ			
			FOR DETAIL BREAKDOWN SEE FIGURE 9A			
-185A	38686		. SCREW, HEX HD- 1/4-20 X 0.500 LG			
-185B	6935		. LOCKWASHER, SPLIT- 0.250 ID X 0.493 OD			
-185C	3550		. WASHER, FL- 0.250 ID X 0.562 OD			
-186	5576671	1	. COVER ASM			
-187	130434	2	. SCREW, SLOTTED HEX HD 10-32 X 0.375 LG			ATT PT
-188	9092	2	. LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD			ATT PT
-189	1940	2	. WASHER, FLAT- 0.192 ID X 0.562 OD			ATT PT
-190	11598	2	. . NUT, HEX- 10-32			
-191	9098	2	. . LOCK WASHER			
-192	1940	2	. . WASHER, FLAT- 0.192 ID X 0.562 OD			
-193	4138371	1	. . BRACKET			
-194	32042	2	. . SCREW, BD HD- 10-32 X 0.375 LG			
-195	4138372	1	. . BRACKET			
-196	11598	2	. . NUT, HEX- 10-32			
-197	9092	2	. . LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD			
-198	1940	2	. . WASHER, FLAT- 0.192 ID X 0.562 OD			
-199	1819763	1	. . BRACKET			
-200	11598	2	. . NUT, HEX- 10-32			
-201	9092	2	. . LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD			
-202	1940	2	. . WASHER, FLAT- 0.192 ID X 0.562 OD			
-203	1940	2	. . WASHER, FLAT- 0.192 ID X 0.562 OD			
-204	474405	2	. . PIN			
-205	4138355	1	. . COVER			



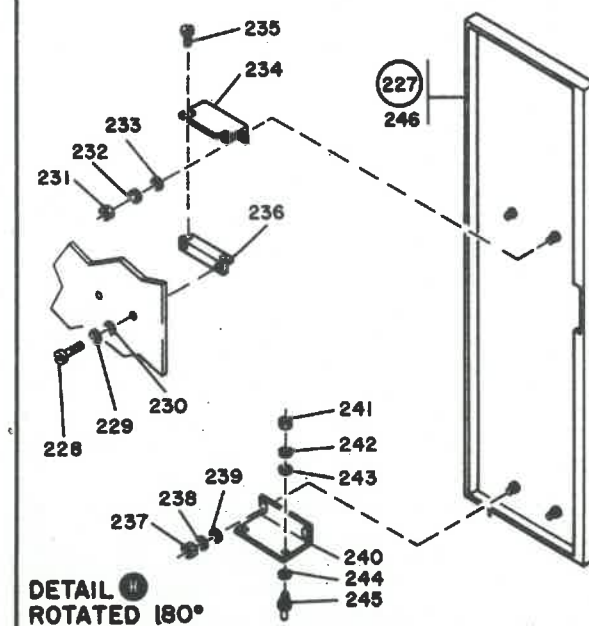
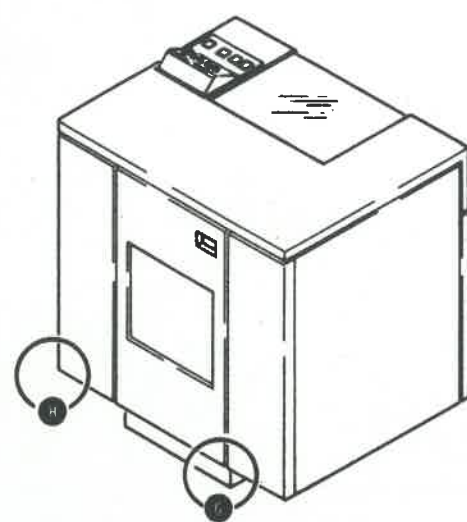
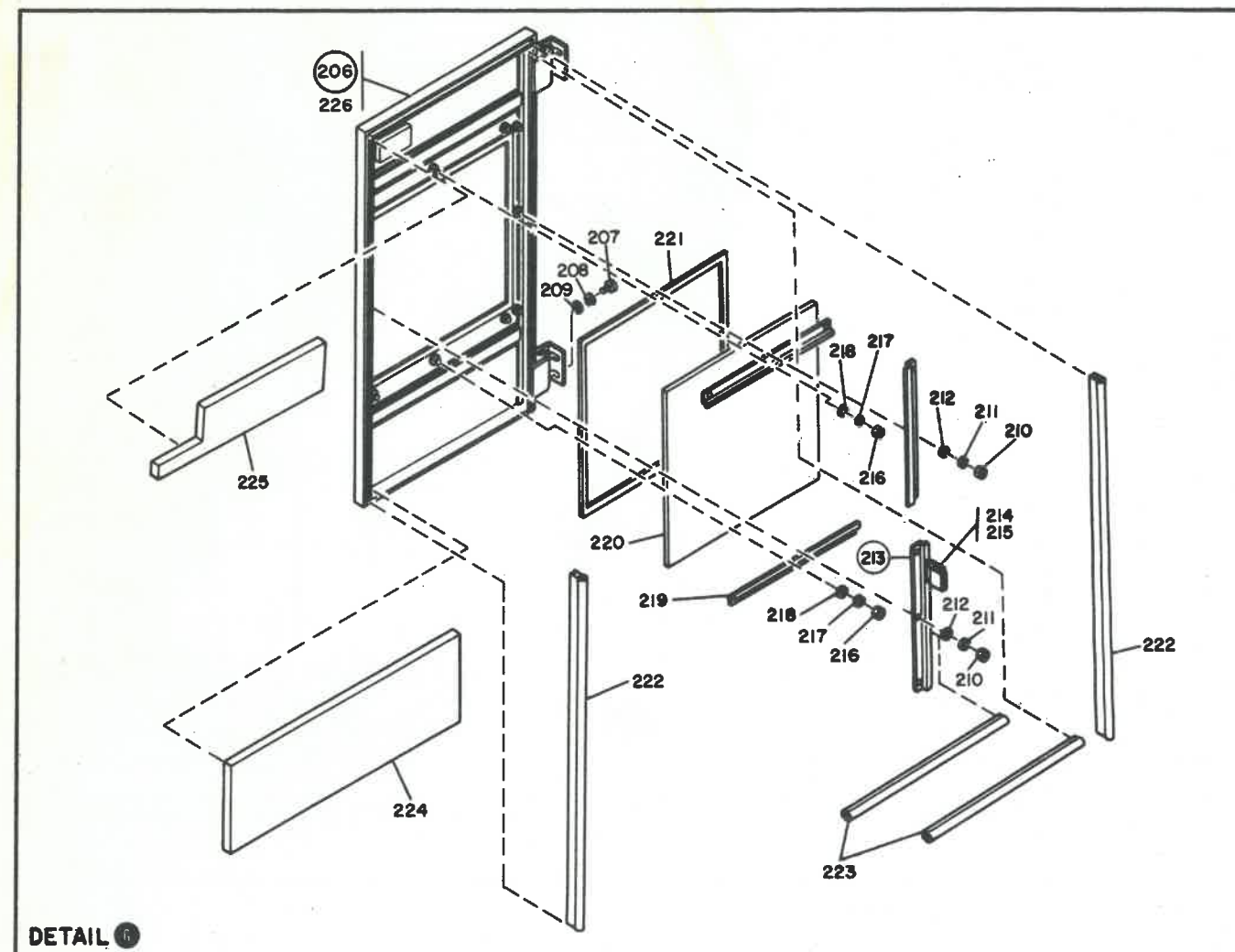


FIGURE 1. FINAL ASSEMBLY. SHEET 5 OF 5. INDEX NOS. 206-246. SEE LIST 1.

# FINAL ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	1 2 3 4	DESCRIPTION
1 -206	4138353	1		DOOR ASM
-207	130434	4		SCREW, SLOTTED HEX HD 10-32 X 0.375 LG
-208	9092	4		LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-209	1940	4		WASHER, FLAT- 0.192 ID X 0.562 OD
-210	11596	3		NUT, HEX- 10-32
-211	9092	3		LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-212	45690	3		WASHER, FL- 0.203 ID X 0.438 OD
-213	4138350	1		CLAMP ASM
-214	113282	2		SCREW
-215	848876	1		LATCH ASM, COVER
-216	11598	9		NUT, HEX- 10-32
-217	9092	9		LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-218	45690	9		WASHER, FL- 0.203 ID X 0.438 OD
-219	4138349	1		CLAMP
-220	1815113	1		GLASS
-221	4138391	1		SEAL
-222	2526535	1		SEAL, 72 INCHES LG
-223	2526535	2		SEAL, 72 INCHES LG
-224	4138352	1		MAT
-225	4138351	1		MAT
-226	4138348	1		DOOR
-227	5576672	1		COVER ASM, LEFT REAR
-228	130434	2		SCREW, SLOTTED HEX HD 10-32 X 0.375 LG
-229	9092	2		LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-230	1940	2		WASHER, FLAT- 0.192 ID X 0.562 OD
-231	11598	2		NUT, HEX- 10-32
-232	9092	2		LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-233	1940	2		WASHER, FLAT- 0.192 ID X 0.562 OD
-234	4138371	1		BRACKET
-235	32042	2		SCREW, BD HD- 10-32 X 0.375 LG
-236	4138372	1		BRACKET
-237	11598	2		NUT, HEX- 10-32
-238	9092	2		LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-239	1940	2		WASHER, FLAT- 0.192 ID X 0.562 OD
-240	1819763	1		BRACKET
-241	11598	2		NUT, HEX- 10-32
-242	9092	2		LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-243	1940	2		WASHER, FLAT- 0.192 ID X 0.562 OD
-244	1940	2		WASHER, FLAT- 0.192 ID X 0.562 OD
-245	474405	2		PIN
-246	4138355	1		COVER

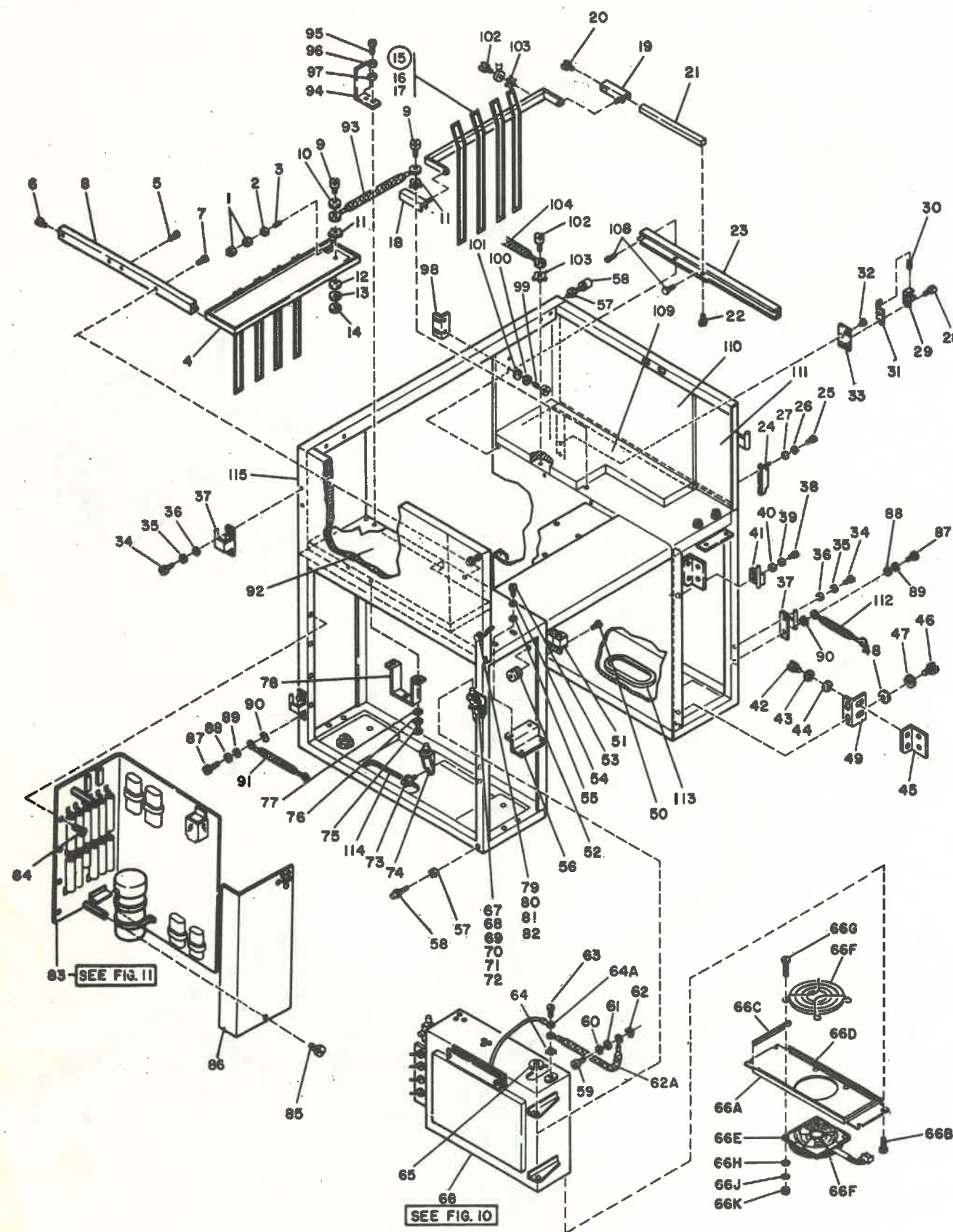


FIGURE 2. LOWER STRUCTURE ASSEMBLY. SHEET 1 OF 2. INDEX NOS. 1-115. SEE LIST 2.

# LOWER STRUCTURE ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
2 -	1815055	REF	LOWER STRUCTURE ASSEMBLY FOR NEXT HIGHER ASSEMBLY SEE FIGURE 1-115 FOR ILLUSTRATION SEE FIGURE 2
- 1	11598	4	NUT, HEX- 10-32 ATT PT
- 2	324	2	WASHER, FL- 0.193 ID X 0.750 OD ATT PT
- 3	736860	2	SPRING
- 4	1819767	1	FRONT GUIDE ASM
- 5	104763	2	SCREW, CAP, SOC HD- 10-32 X 1/2 LG ATT PT
- 6	58207	2	SCREW, BD HD- 8-32 X 0.250 LG ATT PT
- 7	236849	3	SCREW, BD HD- 10-32 X 0.250 LG ATT PT
- 8	4134996	1	LEFT GUIDE
- 9	32042	2	SCREW, BD HD- 10-32 X 0.375 LG
- 10	45690	1	WASHER, FL- 0.203 ID X 0.438 OD
- 11	56079	2	LOCKWASHER, EXT TEETH- 0.204 ID X 0.410 O
- 12	45690	1	WASHER, FL- 0.203 ID X 0.438 OD
- 13	9092	1	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 14	11598	1	NUT, HPY- 10-32
- 15	5576616	1	REAR GUIDE ASM
- 16	222696	2	BEARING
- 17	4134987	1	GUIDE
- 18	4134990	1	LEFT CHANNEL ASM
- 19	4134991	1	RIGHT CHANNEL ASM
- 20	34512	6	SCREW, BD HD- 8-32 X 0.375 LG ATT PT
- 21	4134992	2	RAIL
- 22	236849	3	SCREW, BD HD- 10-32 X 0.250 LG
- 23	4134995	1	RIGHT GUIDE
- 24	4138365	1	BRACKET
- 25	130434	2	SCREW, SLOTTED HEX HD 10-32 X 0.375 LG ATT PT
- 26	9092	2	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD ATT PT
- 27	1940	2	WASHER, FLAT- 0.192 ID X 0.562 OD ATT PT
- 28	833616	2	STUD
- 29	833618	1	LATCH
- 30	214438	1	SPRING
- 31	833617	1	BRACKET
- 32	236849	2	SCREW, BD HD- 10-32 X 0.250 LG ATT PT
- 33	853634	1	PLATE
- 34	130434	6	SCREW, HEX HD- 10-32 X 0.375 LG ATT PT
- 35	9092	6	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD ATT PT
- 36	1940	6	WASHER, FLAT- 0.192 ID X 0.562 OD ATT PT
- 37	1819762	4	HINGE
- 38	130434	2	SCREW, HEX HD- 10-32 X 0.375 LG ATT PT
- 39	9092	2	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD ATT PT
- 40	1940	2	WASHER, FLAT- 0.192 ID X 0.562 OD ATT PT
- 41	4135028	1	STOP
- 42	130434	6	SCREW, HEX HD- 10-32 X 0.375 LG ATT PT
- 43	9092	6	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD ATT PT
- 44	1940	6	WASHER, FLAT- 0.192 ID X 0.562 OD ATT PT
- 45	1819771	3	BRACKET
- 46	130434	6	SCREW, HEX HD- 10-32 X 0.375 LG ATT PT
- 47	9092	6	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD ATT PT
- 48	1940	6	WASHER, FLAT- 0.192 ID X 0.562 OD ATT PT
- 49	1819770	3	BRACKET
- 50	10170	2	SCREW, BD HD- 6-32 X 0.250 LG ATT PT
- 51	2132050	1	LATCH
- 52	317227	1	GRCHMET
- 53	130434	3	SCREW, HEX HD- 10-32 X 0.375 LG ATT PT
- 54	9092	3	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD ATT PT
- 55	1940	3	WASHER, FLAT- 0.192 ID X 0.562 OD ATT PT
- 56	4138370	1	BRACKET
- 57	3960	4	NUT, HEX- 1/4-20
- 58	255939	4	SCREW ASM, DOOR
- 59	120211	1	SCREW, HEX HD- 10-32 X 0.500 LG
- 60	9092	1	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
- 61	1940	1	WASHER, FLAT- 0.192 ID X 0.562 OD
- 62	56079	1	LOCKWASHER, EXT TEETH- 0.204 ID X 0.410 O
- 62A	518611	1	JUMPER ASM
- 63	34512	1	SCREW, BD HD- 8-32 X 0.375 LG
- 64	55901	1	LOCKWASHER, EXT TEETH- 0.176 ID X .381 OD
- 64A	5733161	1	JUMPER
- 65	251759	2	RING, RET- 0.480 ID X 0.940 OD ATT PT
- 66	1819740	1	LOGIC CHASSIS ASSEMBLY FOR DETAIL BREAKDOWN SEE FIGURE 10
- 66A	4135081	1	PLATE
- 66B	58207	2	SCREW, BD HD- 8-32 X 0.250 LG ATT PT
- 66C	599557	2	SEAL
- 66D	599557	2	SEAL
- 66E	4703241	1	FAN, 208/230V 50/60HZ AND 220/235V 50/60HZ
- 66F	4703240	1	FAN, 200V 50/60HZ



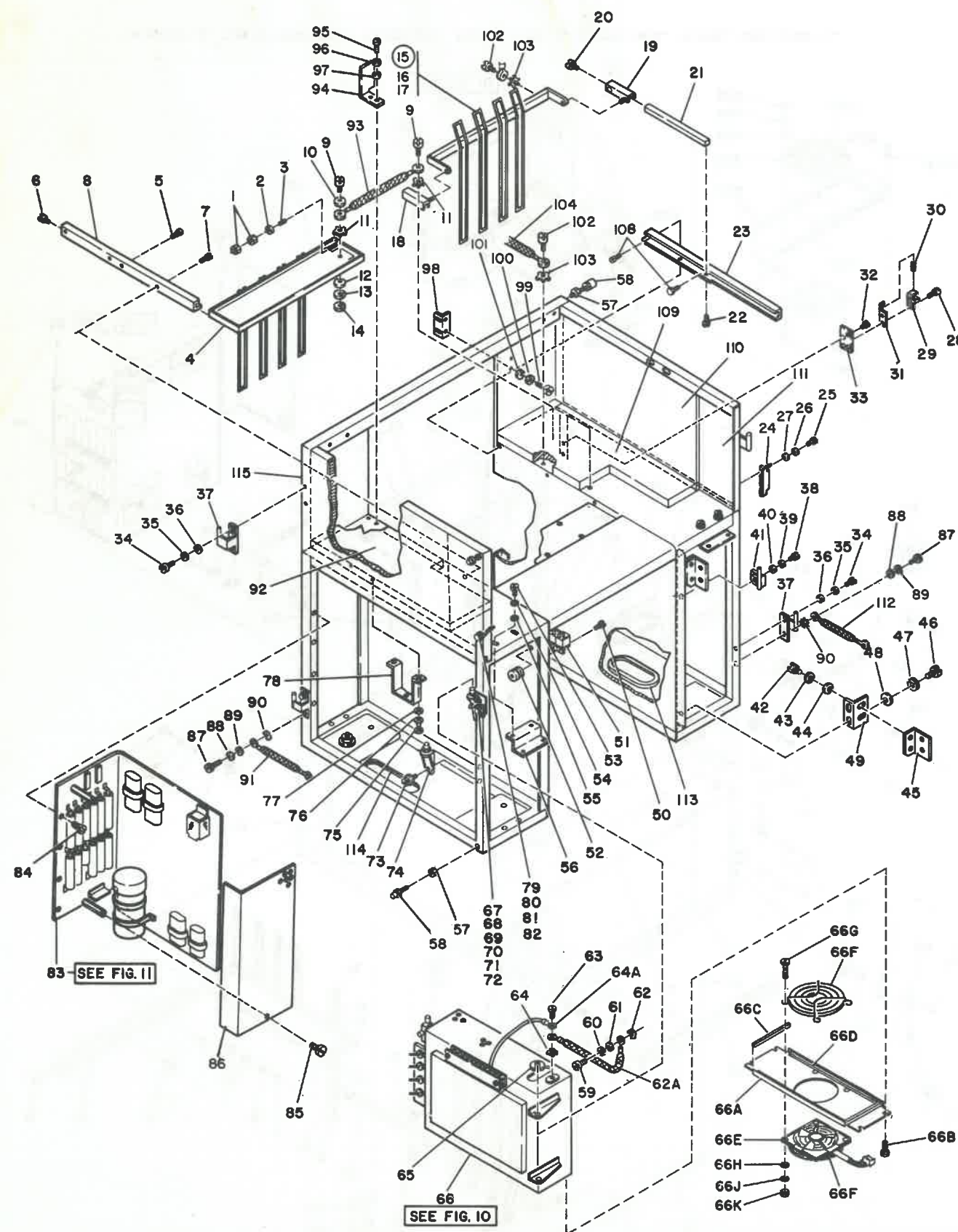


FIGURE 2. LOWER STRUCTURE ASSEMBLY. SHEET 1 OF 2. INDEX NOS. 1-115. SEE LIST 2.

LOWER STRUCTURE ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	1 2 3 4	DESCRIPTION
2	- 66F 2172166	2		. GUARD
	- 66G 322555	4		. SCREW, WACH RH 6-32 X 2-1/4 LG
	- 66H 257986	4		. WASHER, FL- 0.156 ID X 0.312 OD
	- 66J 6364	4		. LOCKWASHER, SPLIT- 0.141 ID X 0.253 OD
	- 66K 257187	4		. NUT, HEX- 6-32
	- 67 833616	2		. STUD
	- 68 214438	1		. SPRING
	- 69 833618	1		. LATCH
	- 70 833617	1		. BRACKET
	- 71 236849	2		. SCREW, BD HD- 10-32 X 0.250 LG
	- 72 853634	1		. PLATE
	- 73 38686	4		. SCREW, HEX HD- 1/4-20 X 0.500 LG ATT PT
	- 74 225532	2		. HINGE ASM
	- 75 130434	2		. SCREW, HEX HD- 10-32 X 0.375 LG ATT PT
	- 76 9092	2		. LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD ATT PT
	- 77 1940	2		. WASHER, FLAT- 0.192 ID X 0.562 OD ATT PT
	- 78 4135083	1		. BRACKET
	- 79 130434	1		. SCREW, HEX HD- 10-32 X 0.375 LG ATT PT
	- 80 9092	1		. LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD ATT PT
	- 81 1940	1		. WASHER, FLAT- 0.192 ID X 0.562 OD ATT PT
	- 82 4138364	1		. BRACKET
	- 83 1819731	1		. POWER PLATE ASSEMBLY FOR DETAIL BREAKDOWN SEE FIGURE 11
	- 84 32042	4		. SCREW, BD HD- 10-32 X 0.375 LG ATT PT
	- 85 34512	2		. SCREW, BD HD- 8-32 X 0.375 LG
	- 86 1819733	1		. COVER
	- 87 120211	2		. SCREW, HEX HD- 10-32 X 0.500 LG
	- 88 9092	2		. LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
	- 89 1940	2		. WASHER, FLAT- 0.192 ID X 0.562 OD
	- 90 56079	2		. LOCKWASHER, EXT TEETH- 0.204 ID X 0.410 O
	- 91 856575	1		. JUMPER ASM
	- 92 4138396	1		. PAD
	- 93 523022	1		. JUMPER ASM
	- 94 5576637	1		. STRIKE
	- 95 130434	2		. SCREW, SLOTTED HEX HD 10-32 X 0.375 LG ATT PT
	- 96 9092	2		. LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD ATT PT
	- 97 1940	2		. WASHER, FLAT- 0.192 ID X 0.562 OD ATT PT
	- 98 5593418	1		. BRACKET
	- 99 130434	2		. SCREW, SLOTTED HEX HD 10-32 X 0.375 LG
	- 100 9092	2		. LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
	- 101 28692	2		. WASHER, FLAT- 0.196 ID X 1.00 OD
	- 102 58207	2		. SCREW, BD HD- 8-32 X 0.250 LG
	- 103 55901	2		. LOCKWASHER, EXT TEETH- 0.176 ID X .381 OD
	- 104 676748	1		. JUMPER ASM
	- 106 55901	1		. WASHER
	- 107 255939	1		. SCREW ASM, DOOR
	- 108 236849	3		. SCREW
	- 109 4138397	AR		. PAD
	- 109 5593464	AR		. PAD
	- 110 4138389	1		. PAD
	- 111 5576640	2		. PAD
	- 112 856575	1		. JUMPER ASM
	- 113 350830	AR		. CHANNEL
	- 114 350830	AR		. CHANNEL
	- 115 4138326	1		. FRAME ASM



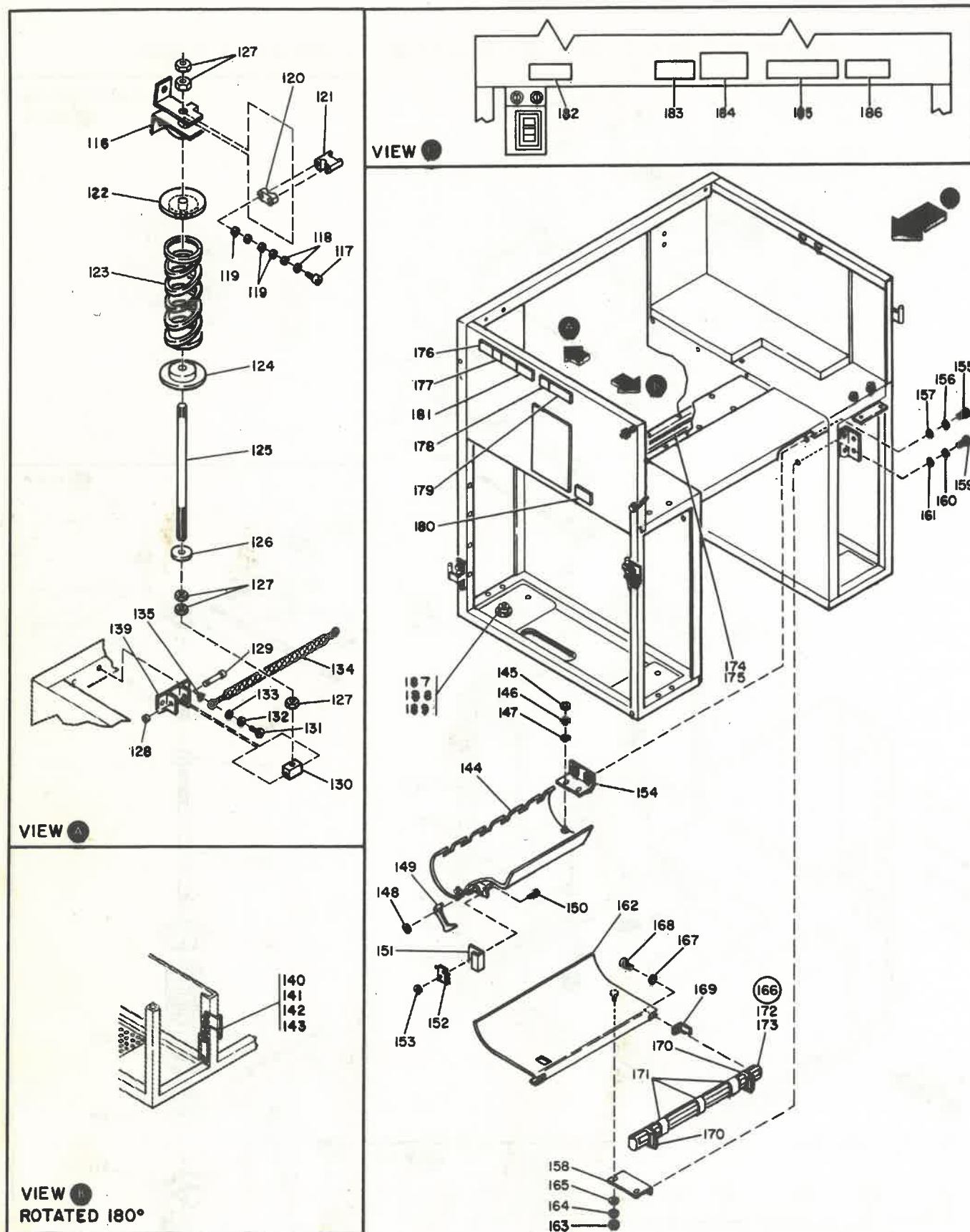


FIGURE 2. LOWER STRUCTURE ASSEMBLY. SHEET 2 OF 2. INDEX NOS. 116-189. SEE LIST 2.

LOWER STRUCTURE ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	1 2 3 4	DESCRIPTION
2				
-116	5576635	2		. BRACKET
-117	332560	4		. SCREW, CAP SOC HD- 8-32 X 1.250 LG
-118	45671	4		. WASHER
-119	4253783	4		. WASHER
-120	5576626	2		. BRAKE
-121	5576627	2		. BRAKE
-122	5576630	2		. GUIDE
-123	5576629	2		. SPRING
-124	5576630	2		. GUIDE
-125	5576631	2		. SHAFT
-126	154214	2		. WASHER, PL 21/64 ID X 1.000 OD X 3/32 THK
-127	4564	10		. NUT, HEX- 5/16-18
-128	257982	2		. CLIP, RETAINING E-TYPE
-129	4253332	2		. STUD
-130	4253789	2		. PIVOT BRACKET
-131	55711	4		. SCREW, MACH HEX HD- 10-32 X 0.562 LG
-132	9092	4		. LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-133	1940	4		. WASHER, FLAT- 0.192 ID X 0.562 OD
-134	253425	1		. JUMPER
-135	56079	1		. LOCKWASHER, EXT TEETH- 0.204 ID X 0.410 O
-139	5576633	2		. BRACKET
-140	130434	2		. SCREW, SLOTTED HEX HD 10-32 X 0.375 LG
-141	9092	2		. LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-142	1940	2		. WASHER, FLAT- 0.192 ID X 0.562 OD
-143	413502E	1		. STOP
-144	1819755	1		. GUIDE ASM, UPPER
-145	1159E	4		. NUT, HEX- 10-32
-146	9092	4		. LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-147	1940	4		. WASHER, FLAT- 0.192 ID X 0.562 OD
-148	1092125	1		. CLIP
-149	4135067	1		. ACTUATOR
-150	438544	2		. SCREW, BD HD- 4-40 X 1.000 LG
-151	5593433	1		. GUARD
-152	1589401	1		. SWITCH ASM
-153	47987	2		. NUT, HEX- 2-56
-154	1815109	2		. BRACKET, UPPER GUIDE
-155	120211	4		. SCREW, HEX HD- 10-32 X 0.500 LG
-156	9092	4		. LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-157	1940	4		. WASHER, FLAT- 0.192 ID X 0.562 OD
-158	1815108	2		. BRACKET, LOWER GUIDE
-159	120211	4		. SCREW, HEX HD- 10-32 X 0.500 LG
-160	9092	4		. LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-161	1940	4		. WASHER, FLAT- 0.192 ID X 0.562 OD
-162	1819756	1		. GUIDE ASM, LOWER
-163	1159E	4		. NUT, HEX- 10-32
-164	9092	4		. LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD
-165	1940	4		. WASHER, FLAT- 0.192 ID X 0.562 OD
-166	5593455	1		. GUIDE ASM
-167	12553	2		. WASHER, PL- 0.187 ID X 0.375 X 0.024 THK
-168	1815411	2		. SCREW, SHOULDER- 6-32
-169	1821336	2		. STOP
-170	1812638	2		. GUIDE, FORNS
-171	1794804	3		. CLIP
-172	5593454	1		. DECAL
-173	1815302	1		. GUIDE-FORMS ENTRANCE
-174	1819764	1		. CHANNEL
-175	38364	6		. SCREW SOCKET
-176	906744	1		. PLATE, SERIAL NO.-US/CANADA/UTC
-176	855282	1		. PLATE, SERIAL NO.-SWEDEN
-177	906758	1		. PLATE, SERIAL NO.-US/CANADA/UTC
-177	855283	1		. PLATE, SERIAL NO.-SWEDEN
-178	842555	1		. PLATE-UL APPROVAL
-178	842556	1		. PLATE-UL APPROVAL
-178	855286	1		. PLATE-UL APPROVAL
-178	960766	1		. PLATE-CSA APPROVAL
-179	6808548	1		. PLATE-POWER RATE- 60 HZ
-179	6808543	1		. PLATE-POWER RATE- 60 HZ
-179	6808542	1		. PLATE-POWER RATE- 50 HZ
-180	369207	1		. LABEL-VOLTAGE
-181	960748	1		. PLATE-PROPERTY OF USA
-181	855263	1		. PLATE-PROPERTY OF USA/UTC
-181	960746	1		. PLATE-PROPERTY OF CANADA
-181	960740	1		. PLATE-MFD BY CANADA
-181	911932	1		. PLATE-MFD IN CANADA
-181	960742	1		. PLATE-RECONDITIONED IN CANADA
-181	960752	1		. PLATE-RECONDITIONED IN CANADA

LOWER STRUCTURE ASSEMBLY

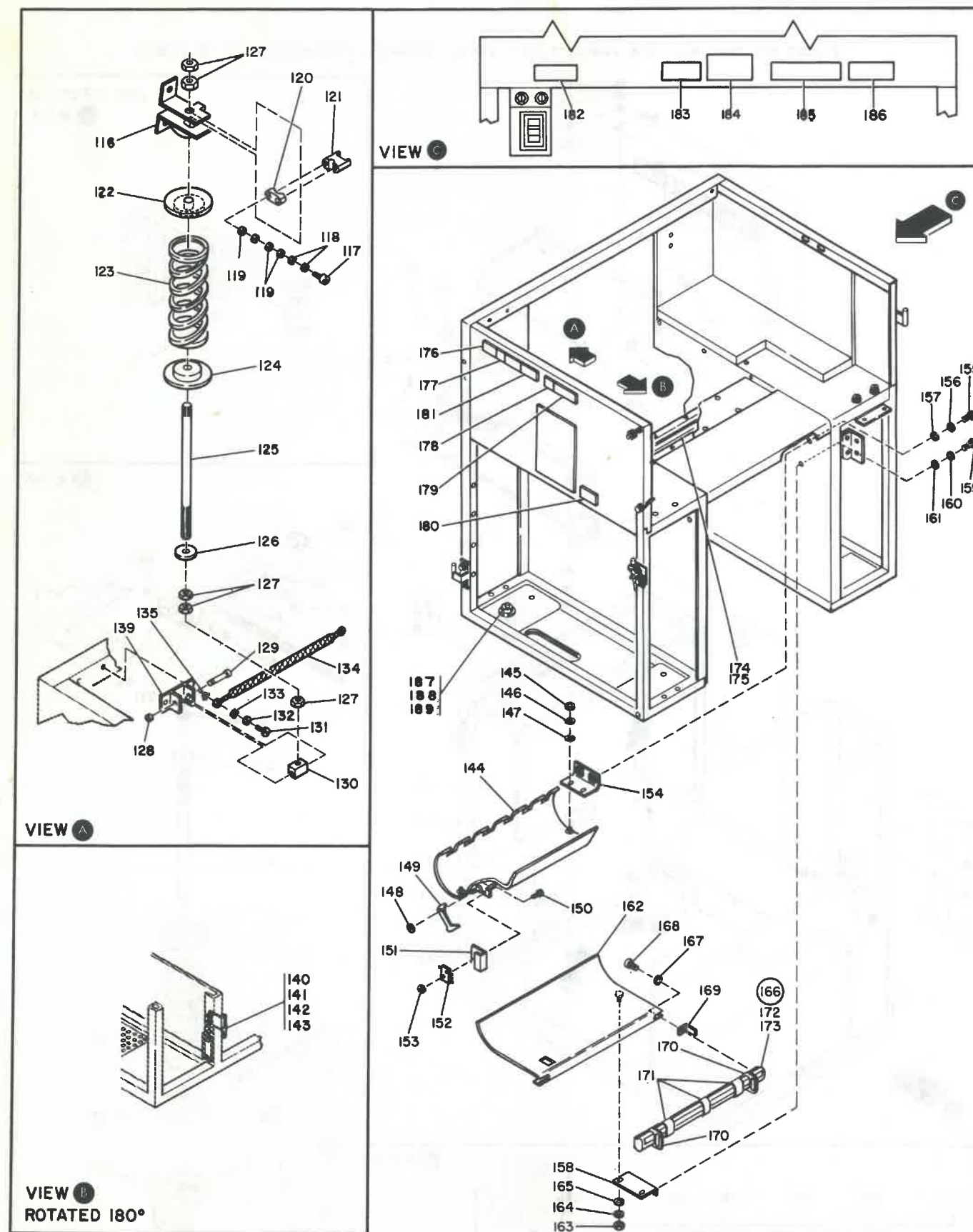


FIGURE 2. LOWER STRUCTURE ASSEMBLY. SHEET 2 OF 2. INDEX NOS. 116-189. SEE LIST 2.

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
2	-181	1	PLATE-RENOVATED FOR CANADA
	-181	1	PLATES-WTC PROPERTY
	-181	1	PLATE-MFD BY WTC
	-181	1	PLATE-MFD FOR WTC
	-181	1	PLATE-RECONDITIONED BY WTC
	-181	1	PLATE-RECONDITIONED FOR WTC
	-181	1	PLATE-RENOVATED BY WTC
	-181	1	PLATE-RENOVATED FOR WTC
	-181	1	PLATE-PROPERTY OF SWEDEN
	-181	1	PLATE-MFD BY SWEDEN
	-181	1	PLATE-RECONDITIONED BY SWEDEN
	-181	1	PLATE-RECONDITIONED FOR SWEDEN
	-181	1	PLATE-RENOVATED BY SWEDEN
	-181	1	PLATE-MFG EXPORT
	-181	1	PLATE-MFG IMPORT
	-181	1	PLATE-REGISTRATION
	-181	1	PLATE-REGISTRATION
	-182	1	LABEL
	-183	1	LABEL
	-184	1	LABEL
	-185	1	LABEL
	-186	1	LABEL
	-187	4	CASTER
	-188	4	NUT, HEX 8-32
	-189	4	LOCKWASHER



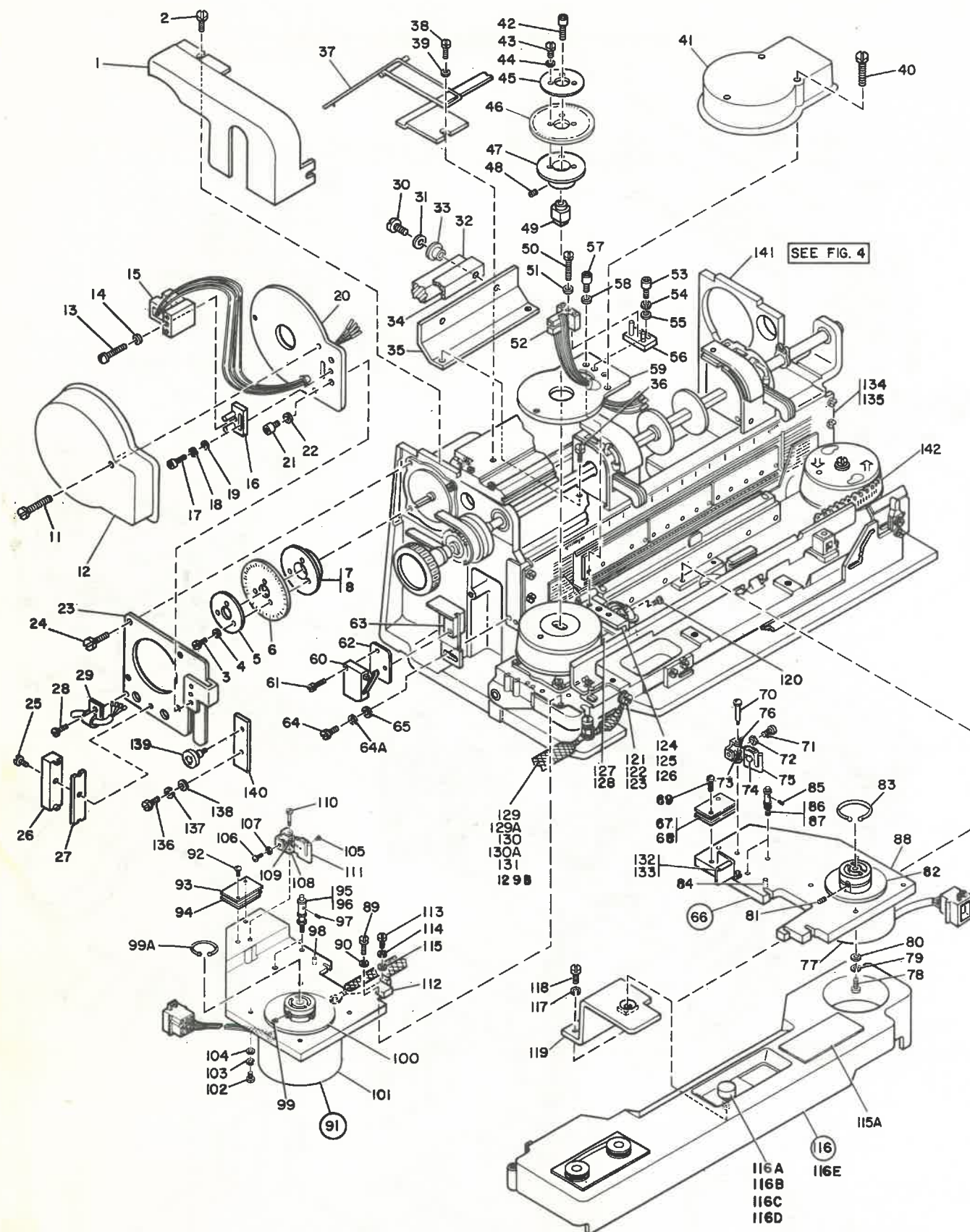


FIGURE 3. MECHANISM FINAL ASSEMBLY. SEE LIST 3.

MECHANISM FINAL ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
3 -	1808563	REF	MECHANISM FINAL ASSEMBLY MODEL 1 FOR NEXT HIGHER ASM SEE FIGURE 1-4 FOR ILLUSTRATION SEE FIGURE 3
-	1808564	REF	MECHANISM FINAL ASSEMBLY MODEL 2 FOR NEXT HIGHER ASM SEE FIGURE 1-4 FOR ILLUSTRATION SEE FIGURE 3
- 1	4135092	1	COVER
- 2	5528	1	SCREW, BD HD- 8-32 X 0.625 LG
- 3	43853E	3	SCREW, BIND HD- 2-56 X 0.250 LG
- 4	257985	1	WASHER, PLAIN- 0.125 ID X 0.250 OD
- 5	4135096	1	STIFFENER, DISC
- 6	4703234	1	DISC, NEW STYLE
- 7	195	1	SETSCREW, 6 FLUTE 10-32 X 1.875 LG
- 8	4135072	1	COLLAR
- 11	4703261	3	SCREW
- 12	5576611	1	COVER ASM- BELT
- 13	438552	1	SCREW, MACH BD HD- 4-40 X 0.750 LG
- 14	257985	1	WASHER, PLAIN- 0.125 ID X 0.250 OD
- 15	6808527	1	TRANSDUCER ASSEMBLY
- 16	4135089	1	BLOCK ASM
- 17	186924	1	SCREW, CAP, SOC HD, FLUTED-4-40 X 0.375 LG
- 18	257984	1	LOCKWASHER, SPLIT- 0.115 ID X 0.212 OD
- 19	257985	1	WASHER, PLAIN- 0.125 ID X 0.250 OD
- 20	5576606	1	SUPPORT
- 21	1072433	2	SCREW, CAP SOC 8-32 X 1/4 LG
- 22	22478	2	WASHER, FL- 0.170 ID X 0.375 OD
- 23	5576639	1	BRACKET
- 24	55198	4	SCREW
- 25	438549	1	SCREW, BD HD- 4-40 X 0.437 LG
- 26	302090	1	BLOCK, TERMINAL
- 27	302131	1	STRIP, INSULATOR 2.094 LG
- 28	58207	1	SCREW, BD HD- 8-32 X 0.250 LG
- 29	2102364	1	CLAMP, LOP- 0.22 ID X 0.17 DIA MTG HOLE
- 30	322551	2	SCREW, BD HD- 6-32 X 0.750 LG
- 31	307286	2	SPACER
- 32	642571	1	BAR
- 33	642597	2	BUSHING
- 34	642598	1	INSULATOR
- 35	4135085	1	BRACKET
- 36	10170	2	SCREW, BD HD- 6-32 X 0.250 LG
- 37	1815105	1	GUIDE, UPPER
- 38	34512	2	SCREW, BD HD- 8-32 X 0.375 LG
- 39	22478	2	WASHER, FL- 0.170 ID X 0.375 OD
- 40	5257443	3	SCREW
- 41	5576611	1	COVER ASM- BELT
- 42	332560	1	SCREW, CAP SOC HD- 8-32 X 1.250 LG
- 43	43853E	3	SCREW, BD HD- 2-56 X 0.250 LG
- 44	257985	3	WASHER, PLAIN- 0.125 ID X 0.250 OD
- 45	4135096	1	STIFFENER, DISC
- 46	4135073	1	DISC
- 47	4135072	1	COLLAR
- 48	195	1	SETSCREW, 6 FLUTE 10-32 X 1.875 LG
- 49	5576607	1	HUB, EMITTER
- 50	4388552	1	SCREW
- 51	257985	1	WASHER, PLAIN- 0.125 ID X 0.250 OD
- 52	6808527	1	TRANSDUCER ASSEMBLY
- 53	186924	1	SCREW, CAP, SOC HD, FLUTED-4-40 X 0.375 LG
- 54	257984	1	LOCKWASHER, SPLIT- 0.115 ID X 0.212 OD
- 55	257985	1	WASHER, PLAIN- 0.125 ID X 0.250 OD
- 56	4135089	1	BLOCK ASM
- 57	1072433	2	SCREW, CAP SOC 8-32 X 1/4 LG
- 58	22478	2	WASHER, FL- 0.170 ID X 0.375 OD
- 59	5576606	1	SUPPORT
- 60	5616034	1	SWITCH
- 61	438550	2	SCREW, BD HD- 4-40 X 0.500 LG
- 62	5312656	1	SHIELD, SWITCH
- 63	5576667	1	BRACKET, SWITCH MTG
- 64	104613	2	SCREW, HEX SOC HD- 8-32 X 0.500 LG
- 64A	1090873	2	LOCKWASHER, SPLIT- 0.168 ID X 0.296 OD
- 65	22478	2	WASHER, FL- 0.170 ID X 0.375 OD
- 66	1815070	1	RIBBON DRIVE ASM- RIGHT
- 67	5576617	1	SWITCH
- 68	749519	2	INSULATOR
- 69	52523	2	SCREW
- 70	749513	1	STUD
- 71	35739	1	SCREW
- 72	257187	2	NUT



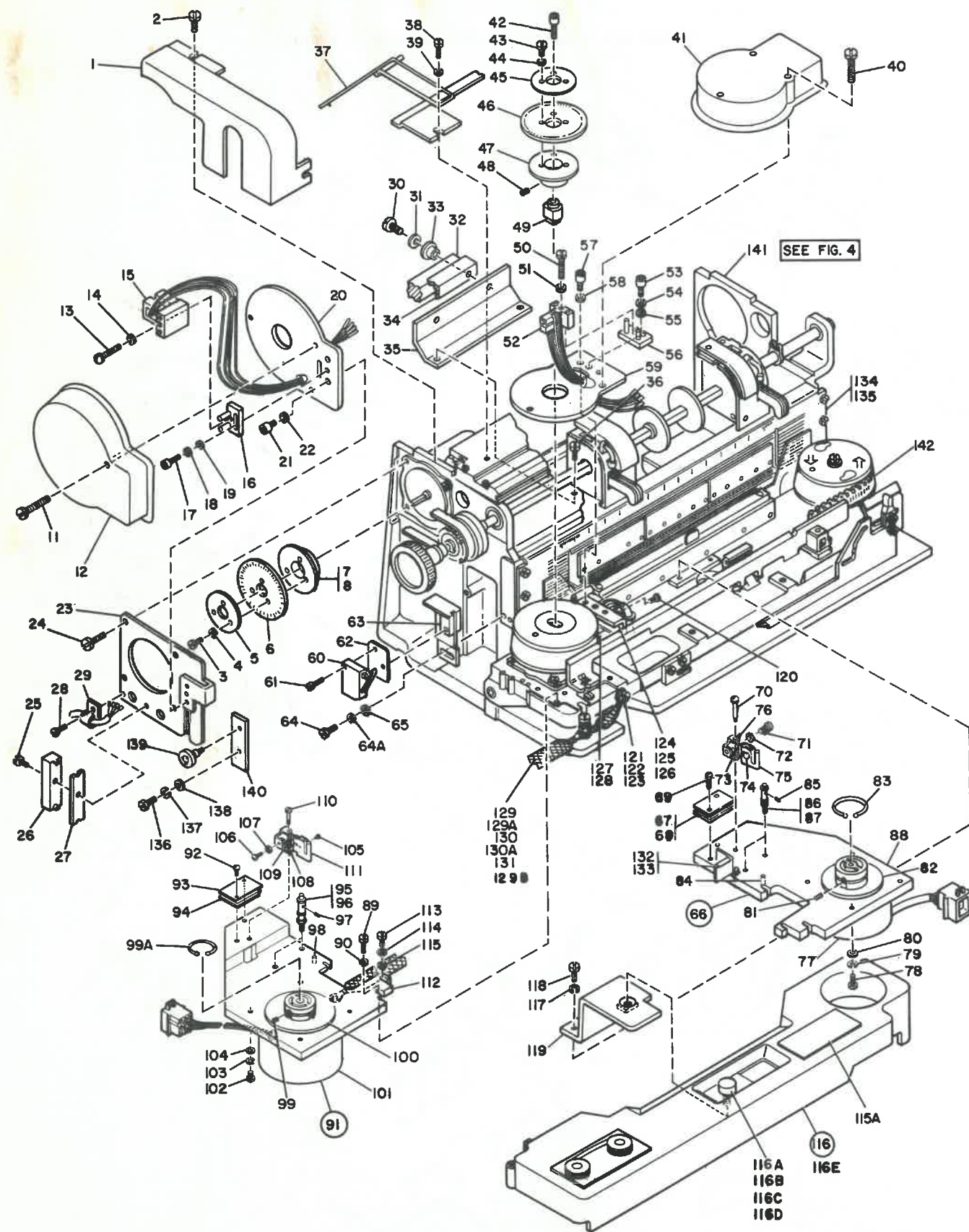


FIGURE 3. MECHANISM FINAL ASSEMBLY. SEE LIST 3.

# MECHANISM FINAL ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
3 - 73	832611	1	.	.	SPRING	
- 74	832610	1	.	.	PIN	
- 75	832626	1	.	.	ACTUATOR, SWITCH	
- 76	832612	1	.	.	ACTUATOR	
- 77	4138363	1	.	.	MOTOR A, STEPPER	
- 78	2994	4	.	.	SCREW	
- 79	9092	4	.	.	LOCK WASHER	
- 80	45690	4	.	.	WASHER	
- 81	257971	2	.	.	SET SCREW	
- 82	4138354	1	.	.	HUB	
- 83	4703260	1	.	.	SPRING	
- 84	234977	2	.	.	PIN	
- 85	257968	2	.	.	SET SCREW	
- 86	1815078	2	.	.	SPOOL ROLL	
- 87	1815067	2	.	.	STUD	
- 88	1815071	1	.	.	PLATE	
- 89	322065	4	.	.	SCREW, BD HD- 6-32 X 0.625 LG	
- 90	257986	4	.	.	WASHER, FL- 0.156 ID X 0.312 OD	
- 91	1815068	1	.	.	RIBBON DRIVE ASM- LEFT	
- 92	52523	2	.	.	SCREW, FIL HD- 4-40 X 0.625 LG	
- 93	5576617	1	.	.	SWITCH	
- 94	749519	2	.	.	SHIELD, SWITCH	
- 95	1815078	2	.	.	SPOOL, ROLL	
- 96	1815095	2	.	.	STUD	
- 97	257968	2	.	.	SCREW, SET, FLATPOINT-6-32 X 0.125 LG	
- 98	234977	1	.	.	PIN, ROLL- 0.135 CD X 0.375 LG	
- 99	257971	2	.	.	SETSCREW, SPLINE DR CUP PT 6-32 X 0.250 LG	
- 99A	4703260	1	.	.	SPRING	
- 100	4138354	1	.	.	HUB	
- 101	4138363	1	.	.	MOTOR ASM- STEPPER	
- 102	2994	4	.	.	SCREW, FIL HD- 10-32 X 0.625 LG	
- 103	9092	4	.	.	LOCKWASHER, SPLIT- 0.194 ID X 0.337 OD	
- 104	45690	4	.	.	WASHER, FL- 0.203 ID X 0.438 OD	
- 105	832610	1	.	.	PIN- 0.093 DIA X 0.380 LG	
- 106	35739	1	.	.	SCREW, BD HD- 6-32 X 0.438 LG	
- 107	257187	2	.	.	NUT, HEX- 6-32	
- 108	832613	1	.	.	ACTUATOR, LEFT	
- 109	832611	1	.	.	SPRING	
- 110	749513	1	.	.	STUD- 4-40 X 1.134 LG	
- 111	832626	1	.	.	ACTUATOR, SWITCH	
- 112	1815069	1	.	.	PLATE	
- 113	5528	2	.	.	SCREW, BD HD- 8-32 X 0.625 LG	
- 114	1090873	2	.	.	LOCKWASHER, SPLIT- 0.168 ID X 0.296 OD	
- 115	22478	2	.	.	WASHER, FL- 0.170 ID X 0.375 OD	
- 115A	5593447	1	.	.	LABEL-ENGLISH/JAPANESE	
- 115A	4703263	1	.	.	LABEL-ITALIAN	
- 115A	4703265	1	.	.	LABEL-GERMAN	
- 115A	6808537	1	.	.	LABEL-FRENCH	
- 115A	4703262	1	.	.	LABEL-CANADIAN FRENCH	
- 115A	4703264	1	.	.	LABEL-SPANISH	
- 116	5593430	1	.	.	COVER ASSEMBLY	
- 116A	5576673	1	.	.	FASTENER	
- 116B	753317	1	.	.	SPRING	
- 116C	1940	1	.	.	WASHER, FLAT- 0.192 ID X 0.562 OD	
- 116D	257701	1	.	.	CLIP	
- 116E	5593458	1	.	.	COVER	
- 117	10170	2	.	.	SCREW, BD HD- 6-32 X 0.250 LG	
- 118	6364	2	.	.	LOCKWASHER, SPLIT- 0.141 ID X 0.253 OD	
- 119	5576664	1	.	.	BRACKET	
- 120	34512	1	.	.	SCREW, BD HD- 8-32 X 0.375 LG	
- 121	856575	1	.	.	JUMPER ASM	
- 122	58207	1	.	.	SCREW	
- 123	55901	1	.	.	LOCK WASHER	
- 124	302131	1	.	.	STRIP, INSULATOR 2.094 LG	
- 125	302090	1	.	.	BLOCK, TERMINAL	
- 126	438549	1	.	.	SCREW, BD HD- 4-40 X 0.437 LG	
- 127	55918	2	.	.	SCREW, BD HD- 10-32 X 0.625 LG	
- 128	5576609	1	.	.	BRACKET	
- 129	438602	1	.	.	SCREW, MACH BD HD- 10-32 X 1.500 LG	
- 129A	313385	2	.	.	SPACER	
- 129B	759024	1	.	.	STANDOFF	
- 130	56079	1	.	.	LOCKWASHER, EXT TEETH- 0.204 ID X 0.410 O	
- 131	856575	1	.	.	JUMPER ASM	
- 132	5593457	1	.	.	GUIDE	
- 133	251970	1	.	.	SCREW, BD HD- 4-40 X 0.250 LG	ATT PT
- 134	1794535	1	.	.	GUIDE ASM-MODEL 1	
- 134	1821426	1	.	.	GUIDE ASM-MODEL 2	

MECHANISM FINAL ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
3 -135	186758	4	. SCREW,BD HD- 8-32 X 0.437 LG ATT PT			
-136	130434	1	. SCREW,SLOTTED HEX HD 10-32 X 0.375 LG			
-137	9092	1	. LOCKWASHER,SPLIT- 0.194 ID X 0.337 OD ATT PT			
-139	5576646	1	. BEARING			
-140	5576644	1	. SLIDE			
-141	1794573	1	. BASIC MECHANISM ASM			
			FOR DETAIL BREAKDOWN SEE FIGURE 4			
-142	1794986	1	. BELT,US-CANADA,48 CHAR SET,.079 HI			
-142	1794987	1	. BELT,US-CANADA,64 CHAR SET,.079 HI -EBCDIC			
-142	1794988	1	. BELT,US-CANADA,64 CHAR SET,.079 HI -ASCII			
-142	1795023	1	. BELT,US-CANADA,38 CHAR SET,.095 HI			
-142	1795022	1	. BELT,US-CANADA,42 CHAR SET,.095 HI			
-142	1795244	1	. BELT,US-CANADA,48 CHAR SET,.095 HI			
-142	1794622	1	. BELT,US-CANADA,64 CHAR SET,.095 HI			
-142	1794623	1	. BELT,US-CANADA,96 CHAR SET,.095 HI			
-142	1794975	1	. BELT,CANADA-FRANCE,48 CHAR SET,.079 HI			
-142	1794976	1	. BELT,CANADA-FRANCE,64 CHAR SET,.079 HI			
-142	1795208	1	. BELT,CANADA-FRANCE,48 CHAR SET,.095 HI			
-142	1794624	1	. BELT,CANADA-FRANCE,64 CHAR SET,.095 HI			
-142	1794625	1	. BELT,CANADA-FRANCE,96 CHAR SET,.095 HI			
-142	1794688	1	. BELT,FRANCE,48 CHAR SET,.079 HI			
-142	1794693	1	. BELT,FRANCE,64 CHAR SET,.079 HI			
-142	1795208	1	. BELT,FRANCE,48 CHAR SET,.095 HI			
-142	1794879	1	. BELT,FRANCE,64 CHAR SET,.095 HI			
-142	1794880	1	. BELT,FRANCE,96 CHAR SET,.095 HI			
-142	1794912	1	. BELT,SPAIN,48 CHAR SET,.079 HI			
-142	1794914	1	. BELT,SPAIN,64 CHAR SET,.079 HI			
-142	1795160	1	. BELT,SPAIN,48 CHAR SET,.095 HI			
-142	1794889	1	. BELT,SPAIN,64 CHAR SET,.095 HI			
-142	1794890	1	. BELT,SPAIN,96 CHAR SET,.095 HI			
-142	1794971	1	. BELT,SPANISH SPEAKING,48 CHAR SET,.079 HI			
-142	1794972	1	. BELT,SPANISH SPEAKING,64 CHAR SET,.079 HI			
-142	1795163	1	. BELT,SPANISH SPEAKING,48 CHAR SET,.095 HI			
-142	1794915	1	. BELT,SPANISH SPEAKING,64 CHAR SET,.095 HI			
-142	1794916	1	. BELT,SPANISH SPEAKING,96 CHAR SET,.095 HI			
-142	1794697	1	. BELT,ITALY,48 CHAR SET,.079 HI			
-142	1794836	1	. BELT,ITALY,64 CHAR SET,.079 HI			
-142	1795210	1	. BELT,ITALY,48 CHAR SET,.095 HI			
-142	1794881	1	. BELT,ITALY,64 CHAR SET,.095 HI			
-142	1794882	1	. BELT,ITALY,96 CHAR SET,.095 HI			
-142	1794703	1	. BELT,AUSTRIA-GERMANY,48 CHAR SET,.079 HI			
-142	1794695	1	. BELT,AUSTRIA-GERMANY,52 CHAR SET,.079 HI			
-142	1794917	1	. BELT,AUSTRIA-GERMANY,64 CHAR SET,.079 HI			
-142	1794918	1	. BELT,AUSTRIA-GERMANY,64 CHAR SET,.079 HI			
-142	1795124	1	. BELT,AUSTRIA-GERMANY,48 CHAR SET,.095 HI			
-142	1795030	1	. BELT,AUSTRIA-GERMANY,52 CHAR SET,.095 HI			
-142	1794626	1	. BELT,AUSTRIA-GERMANY,64 CHAR SET,.095 HI			
-142	1794670	1	. BELT,AUSTRIA-GERMANY,96 CHAR SET,.095 HI			
-142	1794929	1	. BELT,UNITED KINGDOM,48 CHAR SET,.079 HI			
-142	1794930	1	. BELT,UNITED KINGDOM,64 CHAR SET,.079 HI			
-142	1795131	1	. BELT,UNITED KINGDOM,48 CHAR SET,.095 HI			
-142	1794962	1	. BELT,UNITED KINGDOM,64 CHAR SET,.095 HI			
-142	1794963	1	. BELT,UNITED KINGDOM,96 CHAR SET,.095 HI			
-142	1794935	1	. BELT,DENMARK-NORWAY,48 CHAR SET,.079 HI			
-142	1794937	1	. BELT,DENMARK-NORWAY,64 CHAR SET,.079 HI			
-142	1795154	1	. BELT,DENMARK-NORWAY,48 CHAR SET,.095 HI			
-142	1794820	1	. BELT,DENMARK-NORWAY,64 CHAR SET,.095 HI			
-142	1794876	1	. BELT,DENMARK-NORWAY,96 CHAR SET,.095 HI			
-142	1794939	1	. BELT,FINLAND-SWEDEN 48 CHAR SET,.079 HI			
-142	1795060	1	. BELT,FINLAND-SWEDEN 64 CHAR SET,.079 HI			
-142	1795157	1	. BELT,FINLAND-SWEDEN 48 CHAR SET,.095 HI			
-142	1794877	1	. BELT,FINLAND-SWEDEN 64 CHAR SET,.095 HI			
-142	1794878	1	. BELT,FINLAND-SWEDEN 96 CHAR SET,.095 HI			
-142	1794927	1	. BELT,BELGIUM,48 CHAR SET,.079 HI			
-142	1794933	1	. BELT,BELGIUM,64 CHAR SET,.079 HI			
-142	1795208	1	. BELT,BELGIUM,48 CHAR SET,.095 HI			
-142	1794671	1	. BELT,BELGIUM,64 CHAR SET,.095 HI			
-142	1794672	1	. BELT,BELGIUM,96 CHAR SET,.095 HI			
-142	1794908	1	. BELT,PORTUGAL,48 CHAR SET,.079 HI			
-142	1794910	1	. BELT,PORTUGAL,64 CHAR SET,.079 HI			
-142	1795139	1	. BELT,PORTUGAL,48 CHAR SET,.095 HI			
-142	1794887	1	. BELT,PORTUGAL,64 CHAR SET,.095 HI			
-142	1794888	1	. BELT,PORTUGAL,96 CHAR SET,.095 HI			
-142	1803802	1	. BELT,INTERNATIONAL,48 CHAR SET,.095 HI			
-142	1794952	1	. BELT,INTERNATIONAL,64 CHAR SET,.095 HI			
-142	1794955	1	. BELT,INTERNATIONAL,96 CHAR SET,.095 HI			
-142	1794979	1	. BELT,JAPAN,48 CHAR SET,.079 HI			

MECHANISM FINAL ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
3 -142	1794985	1	. BELT,JAPAN,64 CHAR SET,.079 HI			
-142	1795172	1	. BELT,JAPAN,48 CHAR SET,.095 HI			
-142	1794883	1	. BELT,JAPAN,64 CHAR SET,.095 HI			
-142	1794886	1	. BELT,JAPAN-KATAKANA,96 CHAR SET,.095 HI			
-142	1795106	1	. BELT,JAPAN-KATAKANA,120 CHAR SET,.095 HI			



OPERATOR PANEL ASSEMBLY

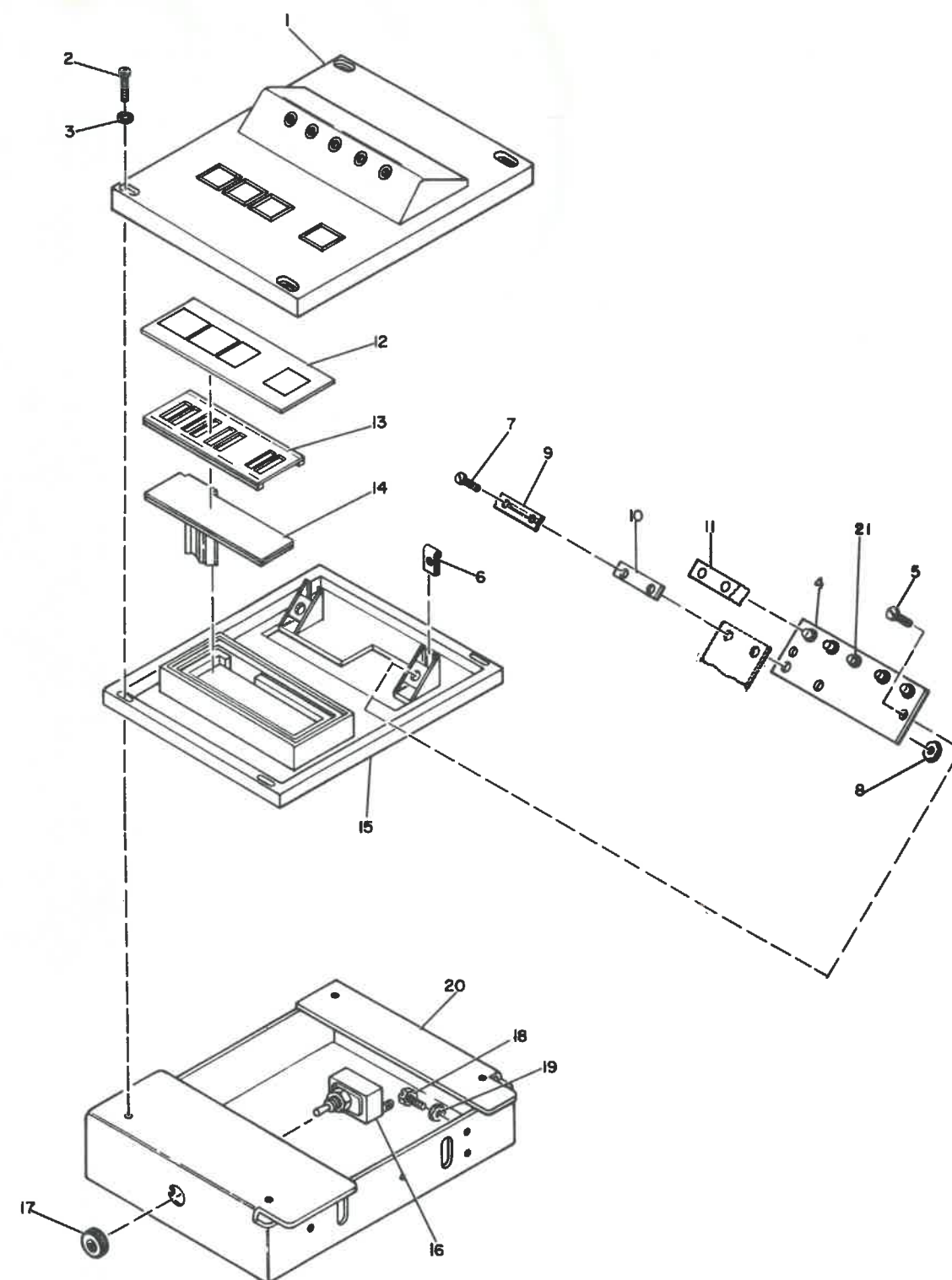


FIGURE 3A. OPERATOR PANEL ASSEMBLY. SEE LIST 3A.

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
3A-	5593446	REF	OPERATOR PANEL ASSEMBLY FOR NEXT HIGHER ASM SEE FIGURE 1-12 FOR ILLUSTRATION SEE FIGURE 3
- 1	4703212	1	COVER ASM, ENGLISH
- 1	4703273	1	COVER ASM, SPANISH
- 1	4703271	1	COVER ASM, FRENCH CANADIAN
- 1	4703270	1	COVER ASM, GERMAN
- 1	4703273	1	COVER ASM, ITALIAN
- 2	322551	4	SCREW, BD HD- 6-32 X 0.750 LG
- 3	257986	4	WASHER, FL- 0.156 ID X 0.312 OD
- 4	5593440	1	PANEL, TOUCH SENSE LFL
- 5	38235	2	SCREW, BD HD- 6-32 X 0.312 LG
- 6	2194720	2	CLIP
- 7	338238	2	SCREW, BD HD- 4-40 X 0.312 LG
- 8	37913	2	NUT, HEX- 0.375-16
- 9	4135025	1	PLATE, PC BOARD CONTACT
- 10	4135026	1	SPACER
- 11	5593459	1	SEAL
- 12	5593434	1	OVERLAY, ENGLISH
- 12	4703267	1	OVERLAY, SPANISH
- 12	4703269	1	OVERLAY, FRENCH CANADIAN
- 12	4703266	1	OVERLAY, GERMAN
- 12	4703268	1	OVERLAY, ITALIAN
- 13	5593435	1	UNDERLAY
- 14	5593436	1	SWITCH ASM, DIAHRAGM
- 15	5593441	1	HOUSING, GRID SUPPORT
- 16	738826	1	SWITCH
- 17	216323	1	NUT, DRESS-0.469-32
- 18	55711	3	SCREW, MACH HEX HD- 10-32 X 0.562 LG
- 19	11598	3	NUT, HEX- 10-32
- 20	5593443	1	BRACKET, OPERATOR PANEL
- 21	6808586	1	LED, RED
- 21	6808587	1	LED, GREEN
- 21	6808588	3	LED, YELLOW



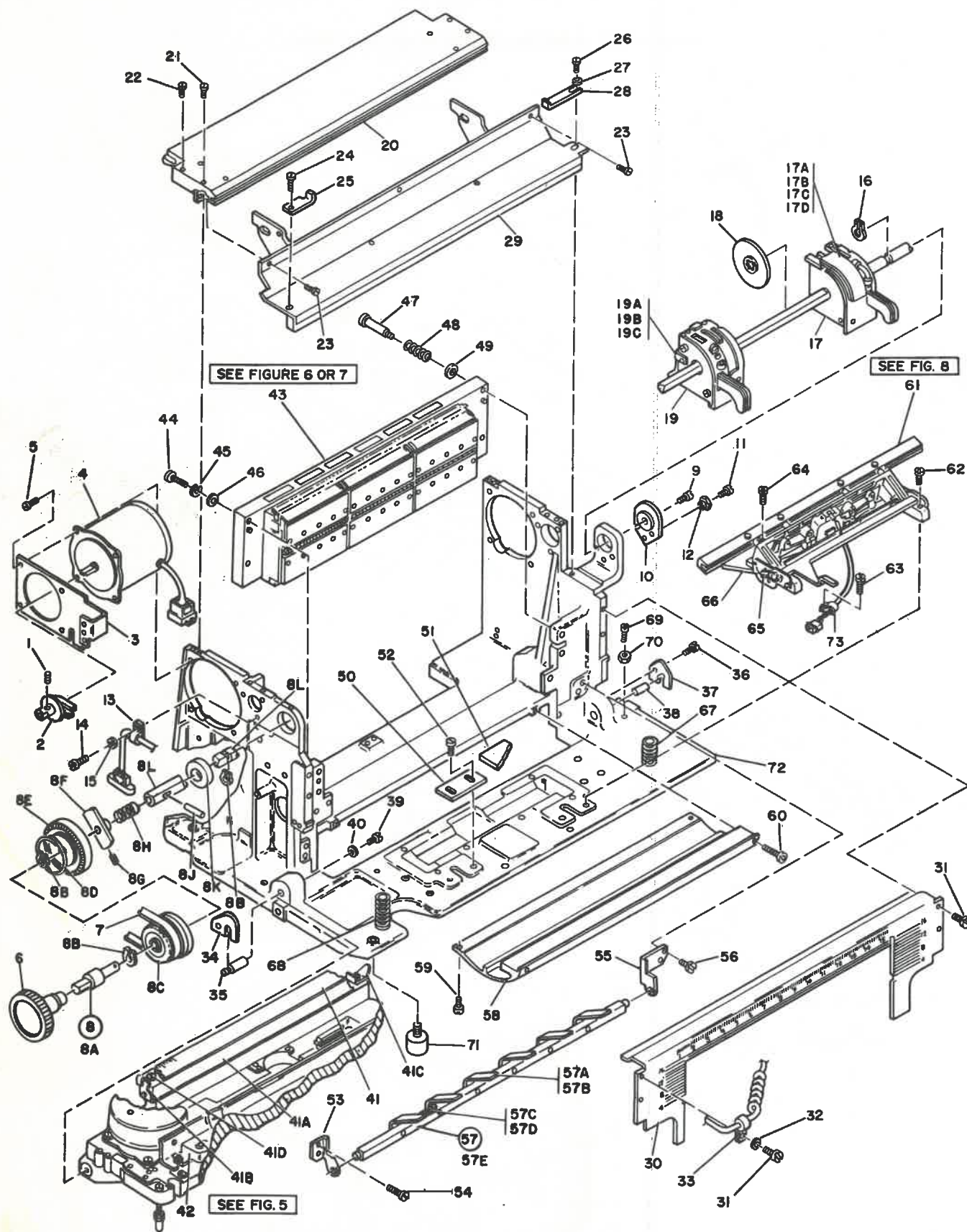


FIGURE 4. BASIC MECHANISM ASSEMBLY. SEE LIST 4.

# BASIC MECHANISM ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
4 -	1794573	REF	BASIC MECHANISM ASSEMBLY FOR NEXT HIGHER ASM SEE FIGURE 3-141 FOR ILLUSTRATION SEE FIGURE 4
- 1	123780	1	SCREW, 6 FLU- 10-32 X 0.188 LG
- 2	4703236	1	PULLEY ASM, 15 TEETH-NEW STYLE
- 3	5576639	4	BRACKET
- 4	4703237	1	MOTOR ASM, NEW STYLE
- 5	55918	4	SCREW, BD HD- 10-32 X 0.625 LG
- 6	1814637	1	KNCR ASSEMBLY
- 7	366291	1	BELT, TIMING- 75 TEETH
- 8	1794532	1	CLUTCH ASSEMBLY, SINGLE FEED
- 8A	1815361	1	ROD
- 8B	839379	3	RING, RETAINER- 0.460 ID
- 8C	1812646	1	GEAR, DRIVE
- 8D	1802014	1	RING, RETAINER
- 8E	1812645	1	CLUTCH
- 8F	1812643	1	DRIVER, CLUTCH
- 8G	257974	1	SETSCREW, FLU- 6-32 X 0.375 LG
- 8H	1812291	1	SPRING, COMPRESSION
- 8J	1815380	1	PIN, DOWEL
- 8K	156231	1	BEARING, BALL- 0.500 ID X 1.125 OD
- 8L	1812306	1	SHAFT, DRIVE
- 9	35739	2	SCREW, BD HD- 6-32 X 0.438 LG
- 10	1814634	1	BEARING ASM
- 11	322065	1	SCREW, BD HD- 6-32 X 0.625 LG
- 12	1814601	1	ECCENTRIC
- 13	5213276	1	CLAMP
- 14	81693	1	SCREW, BD HD- 6-32 X 0.375 LG
- 15	22478	1	WASHER, FL- 0.170 ID X 0.375 OD
- 16	839379	1	RING, RETAINER- 0.460 ID
- 17	1816026	1	TRACTOR ASSEMBLY
- 17A	1816028	1	COVER, RIGHT
- 17A	1816027	1	COVER, LEFT
- 17B	1812272	1	SPRING
- 17C	1812271	1	PIVOT
- 17D	264998	1	ROLL PIN- 0.250 LG
- 18	1794534	2	DISC ASSEMBLY
- 19	1816025	1	TRACTOR ASSEMBLY
- 19A	1812301	1	DETECTOR ASM
- 19B	336628	1	NUT
- 19C	38433	1	SCREW, FL HD- 4-40 X 0.250 LG
- 20	1794618	1	BAR
- 21	5528	2	SCREW, BD HD- 8-32 X 0.625 LG
- 22	845	2	SCREW, FL HD- 8-32 X 0.500 LG
- 23	58207	3	SCREW, BD HD- 8-32 X 0.250 LG
- 24	34512	1	SCREW, BD HD- 8-32 X 0.375 LG
- 25	1794814	1	STOP
- 26	25627	1	SCREW, BD HD- 8-32 X 0.500 LG
- 27	22478	1	WASHER, FL- 0.170 ID X 0.375 OD
- 28	1814630	1	STOP
- 29	1821429	1	SEAL ASM
- 30	1821426	1	GUIDE ASM, PRINT POSITION
- 31	186758	4	SCREW, BD HD- 8-32 X 0.437 LG
- 32	22478	1	WASHER, FL- 0.170 ID X 0.375 OD
- 33	5213276	1	CLAMP
- 34	1815419	1	SPACER
- 35	1815417	1	PIN
- 36	34512	2	SCREW, BD HD- 8-32 X 0.375 LG
- 37	1815419	1	SPACER
- 38	1815416	1	PIN
- 39	34512	1	SCREW, BD HD- 8-32 X 0.375 LG
- 40	23141	1	WASHER, FLAT- 0.199 ID X 0.562 OD
- 41	1754806	1	SCALE
- 41A	1794787	1	SHIELD, MODEL 1 AND 2
- 41B	1794792	1	BRACKET
- 41C	1794791	1	BRACKET
- 41D	10170	2	SCREW, BD HD- 6-32 X 0.250 LG
- 42	1794572	1	FRONT ASSEMBLY FOR DETAIL BREAKDOWN SEE FIGURE 5
- 43	6808520	1	FORMS GUIDE ASSEMBLY-MODEL 1 FOR DETAIL BREAKDOWN SEE FIGURE 6
- 43	1794826	1	HAMMER UNIT ASSEMBLY, MODEL 2 FOR DETAIL BREAKDOWN SEE FIGURE 7
- 44	438588	2	SCREW, BD HD- 8-32 X 1.250 LG
- 45	1090873	2	LOCKWASHER, SPLIT- 0.168 ID X 0.296 OD
- 46	35229	2	WASHER, FL- 0.171 ID X 0.437 OD
- 47	1800702	2	SCREW, SHLDR- 8-32



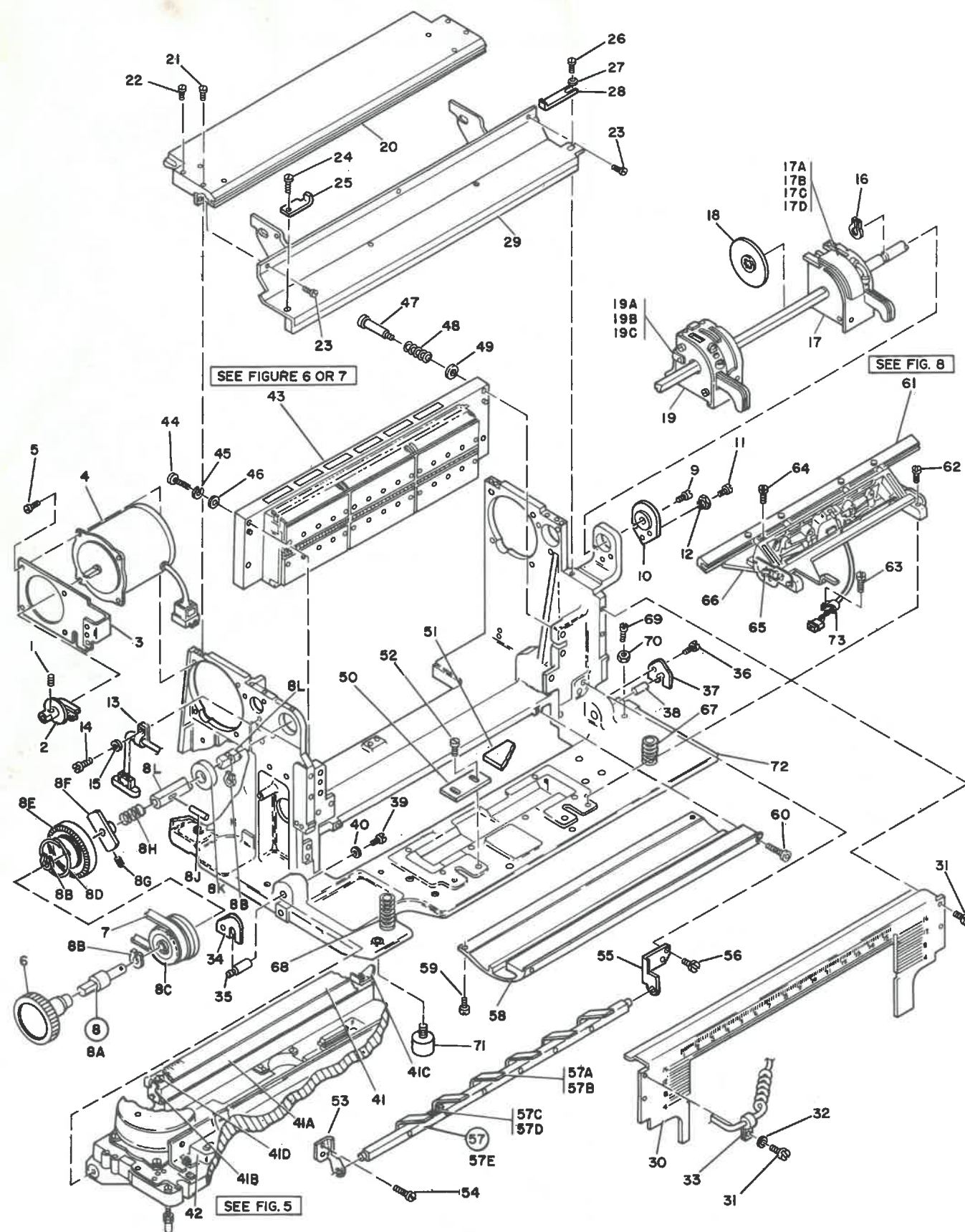


FIGURE 4. BASIC MECHANISM ASSEMBLY. SEE LIST 4.

# BASIC MECHANISM ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
4	- 48	23105	2	. SPRING, COMPRESSION		
	- 49	120571	2	. WASHER		
	- 50	1821393	2	. PLATE		
	- 51	1800481	1	. PLATE		
	- 52	34512	3	. SCREW, BD HD- 8-32 X 0.375 LG		
	- 53	1815888	1	. BRACKET-LH		
	- 54	186759	2	. SCREW, BD HD- 8-32 X 0.312 LG		
	- 55	1815889	1	. BRACKET-RH		
	- 56	186759	1	. SCREW, BD HD- 8-32 X 0.312 LG		
	- 57	1815892	1	. BAR ASM, TENSION		
	- 57A	1815887	6	. SPRING		
	- 57B	55726	6	. SCREW, BD HD- 6-32 X 0.188 LG		
	- 57C	1815890	1	. BRACKET		
	- 57D	55726	2	. SCREW, BD HD- 6-32 X 0.188 LG		
	- 57E	1815886	1	. BAR, FORMS TENSION		
	- 58	1815870	1	. GUIDE, LOWER		
	- 59	5528	2	. SCREW, BD HD- 8-32 X 0.625 LG		
	- 60	186952	2	. SCREW, SOC HEX HD- 10-32 X 1.750 LG		
	- 61	1794970	1	. CLAMP ASSEMBLY		
	- 62	438586	2	. SCREW, BD HD- 8-32 X 0.875 LG		
	- 63	25627	1	. SCREW, BD HD- 8-32 X 0.500 LG		
	- 64	25627	2	. SCREW, BD HD- 8-32 X 0.500 LG		
	- 65	1164127	1	. CLEVIS ASSEMBLY, INDEX LINK		
	- 66	1076717	1	. LINK		
	- 67	1821330	1	. SPRING, COMPRESSION		
	- 68	1821330	1	. SPRING, COMPRESSION		
	- 69	2031	1	. SCREW, FIL HD- 8-32 X 0.625 LG		
	- 70	257189	1	. NUT, HEX- 8-32		
	- 71	1800685	1	. MOUNT, SHOCK		
	- 72	1794900	1	. CASTING		
	- 73	5213276	1	. CLAMP		
				FOR DETAIL BREAKDOWN SEE FIGURE 8		
				ATT PT		

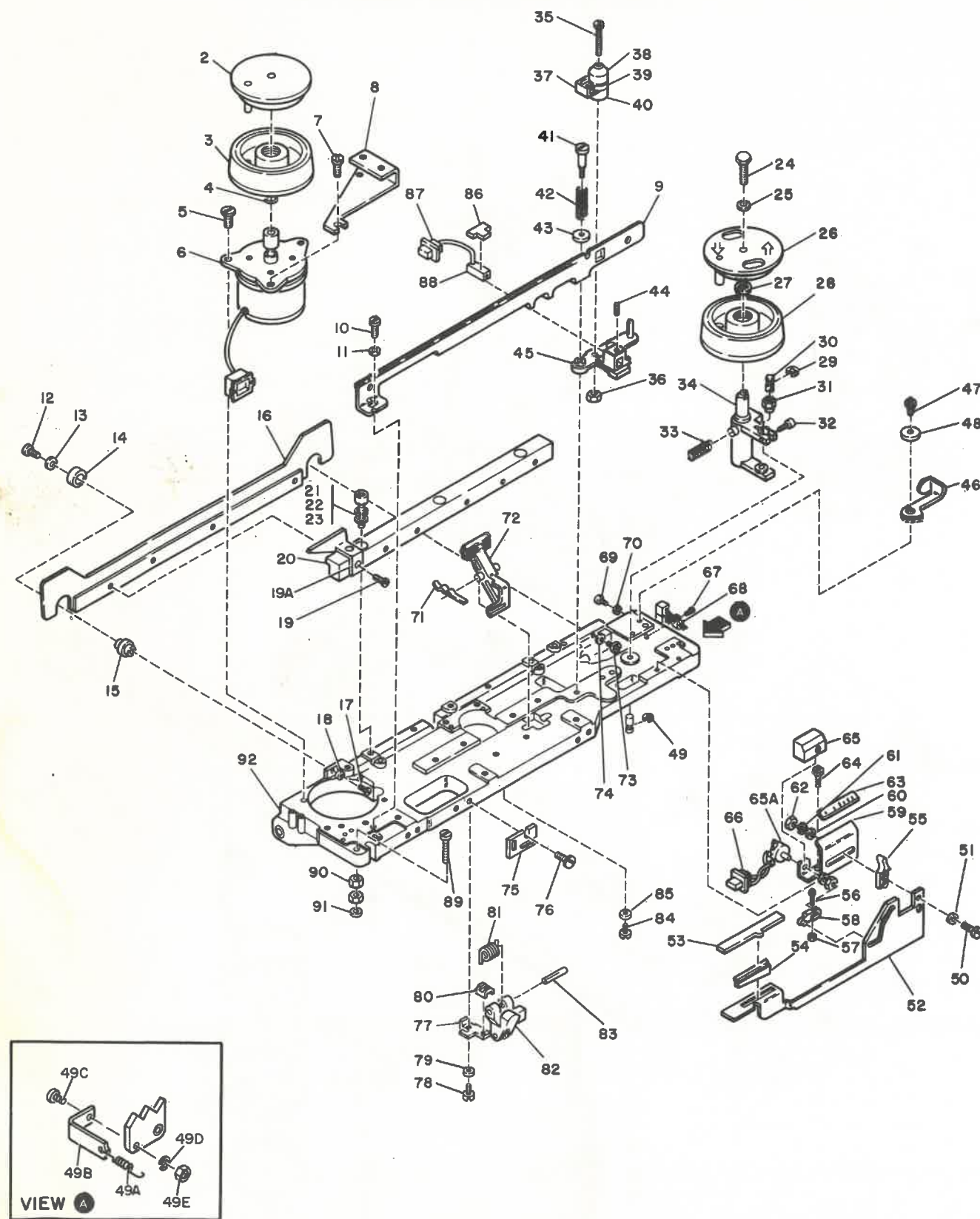


FIGURE 5. FRONT ASSEMBLY. SEE LIST 5.

# FRONT ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
5 -	1794572	REP	FRONT ASSEMBLY FOR NEXT HIGHER ASM SEE FIGURE 4-42 FOR ILLUSTRATION SEE FIGURE 5
- 2	1821401	1	FLYWHEEL ASM
- 3	1801905	1	PULLEY ASSEMBLY, DRIVE
- 4	251227	1	RING, RETAINING
- 5	32042	1	SCREW, BD HD- 10-32 X 0.375 LG
- 6	1816039	1	MOTOR ASM
- 7	55916	2	SCREW, BD HD- 10-32 X 0.625 LG
- 8	5576609	1	BRACKET
- 9	4136961	1	GUARD
- 10	25627	1	SCREW, BD HD- 8-32 X 0.500 LG
- 11	22478	1	WASHER, FL- 0.170 ID X 0.375 OD
- 12	55726	2	SCREW, BD HD- 6-32 X 0.188 LG
- 13	22478	2	WASHER, FL- 0.170 ID X 0.375 OD
- 14	1821358	2	BEARING- 0.354 ID X 0.944 OD X 0.276 THK
- 15	1815421	2	STUD- 6-32
- 16	5576604	1	SHIELD ASM
- 17	10170	1	SCREW, BD HD- 6-32 X 0.250 LG
- 18	1090394	1	WASHER, FL- 0.155 ID X 0.312 OD
- 19	438552	6	SCREW, MACH BD HD- 4-40 X 0.750 LG
- 19A	5593456	1	GUIDE
- 20	1794691	1	PLATEN, BASIC
- 21	186931	3	SCREW, CAP HEX SOC HD- 8-32 X 1.500 LG
- 22	35229	3	WASHER, FL- 0.171 ID X 0.437 OD
- 23	1090873	3	LOCKWASHER, SPLIT- 0.168 ID X 0.296 OD
- 24	1091035	1	SCREW, HEX HD- 8-32 X 0.375 LG
- 25	856516	2	WASHER, FL- 0.173 ID X 0.560 OD
- 26	1812464	1	COVER, IDLER
- 27	1794754	1	PLATE, WEAR
- 28	1801906	1	PULLEY ASSEMBLY, IDLER
- 29	257982	1	CLIP, RETAINING E-TYPE
- 30	1754809	1	SHAFT
- 31	1794808	1	ECCENTRIC
- 32	186929	1	SCREW, CAP, SOC HD, FLUTED- 6-32 X 0.875 LG
- 33	1800527	1	SPRING, COMPRESSION
- 34	1812463	1	PIVOT ASSEMBLY
- 35	438589	1	SCREW, BD HD- 8-32 X 1.500 LG
- 36	1794837	1	NUT
- 37	1794758	1	CLEANER
- 38	1815409	1	SUPPORT, UPPER BEARING
- 39	1794753	1	BEARING
- 40	1815410	1	SUPPORT, LOWER BEARING
- 41	1812457	2	SCREW, SHOULDER- 8-32
- 42	1794770	2	SPRING
- 43	139050	2	WASHER, FL- 0.252 ID X 0.812 OD
- 44	257956	1	SETSCREW, FL PT- 4-40 X 0.187 LG
- 45	1794838	1	BRACKET ASM
- 46	5576636	1	LEVER
- 47	332620	1	SCREW, BD HD- 10-32 X 0.500 LG
- 48	1812334	1	SPACER
- 49	257982	1	CLIP, RETAINING E-TYPE
- 49A	1815420	1	SPRING
- 49B	1815418	1	BRACKET
- 49C	322550	1	SCREW, BD HD- 6-32 X 0.500 LG
- 49D	6364	1	LOCKWASHER, SPLIT- 0.141 ID X 0.253 OD
- 49E	257187	1	NUT, HEX- 6-32
- 50	438551	1	SCREW, BD HD- 4-40 X 0.625 LG
- 51	807612	1	WASHER, FLAT- 0.113 ID X 0.312 OD
- 52	1821421	1	CARRIER
- 53	1810966	1	PLATE, RAMP
- 54	1794649	1	RAMP
- 55	1810967	1	RNCB
- 56	438542	1	SCREW, BD HD- 2-56 X 0.500 LG
- 57	47987	1	NUT, HEX- 2-56
- 58	1801999	1	FOLLOWER
- 59	1810964	1	BRACKET, INDICATOR
- 60	807612	1	WASHER, FLAT- 0.113 ID X 0.312 OD
- 61	257984	1	LOCKWASHER, SPLIT- 0.115 ID X 0.212 OD
- 62	37913	1	NUT, HEX- 0.375-16
- 63	1810963	1	LABEL
- 64	38235	1	SCREW, BD HD- 6-32 X 0.312 LG
- 65	1812493	1	COVER, POTENTIOMETER
- 65A	1810970	1	POTENTIOMETER ASM
- 66	1166117	1	HOUSING, PIN TERMINAL
- 67	236550	1	SCREW, BD HD- 4-40 X 0.375 LG
- 68	5213276	1	CLAMP



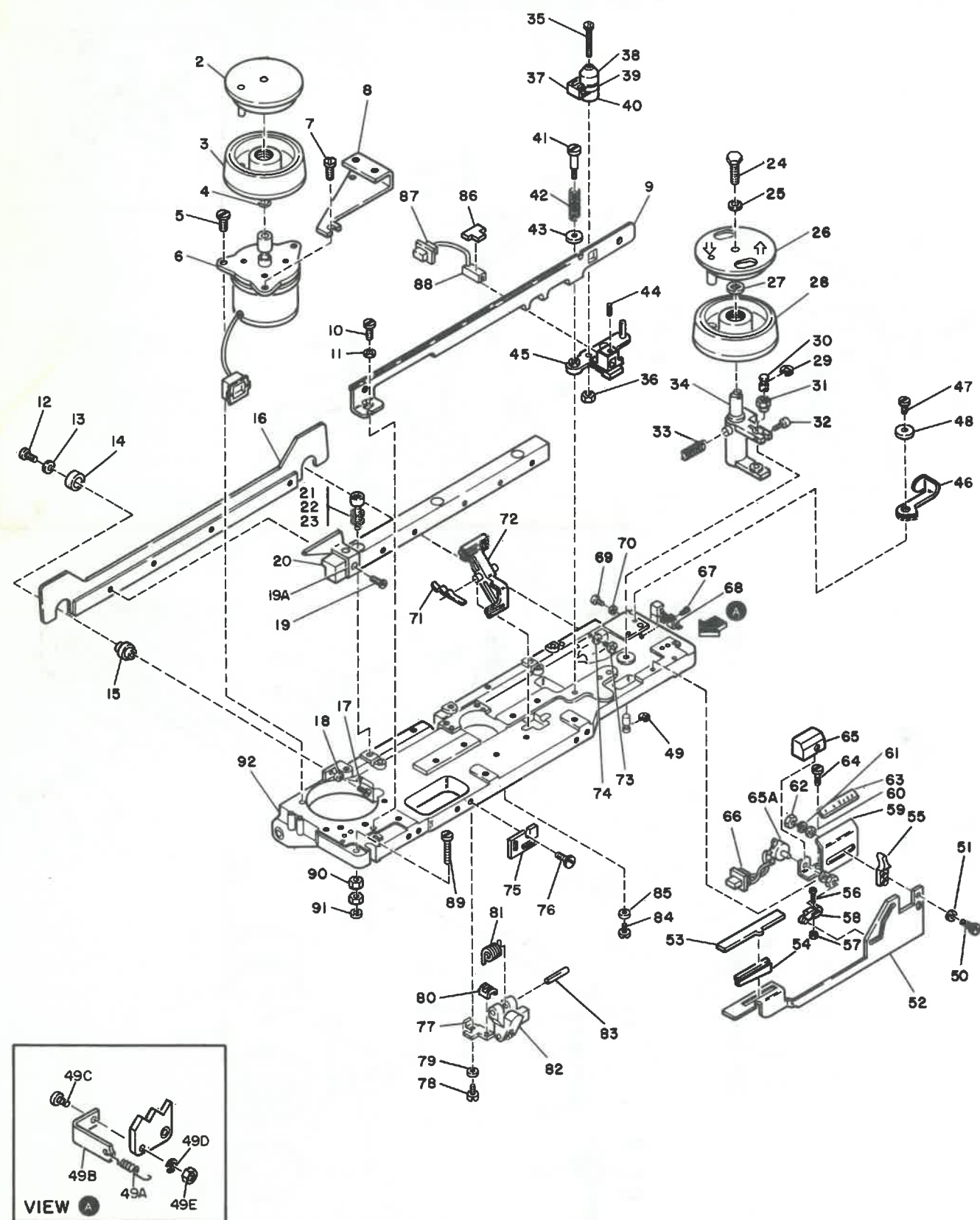


FIGURE 5. FRONT ASSEMBLY. SEE LIST 5.

# FRONT ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
5 - 69	204616	1	. SCREW,HEX HD- 10-32 X 1.000 LG			
- 70	11596	1	. NUT,HEX- 10-32			
- 71	1801991	1	. SPRING,RETAINING			
- 72	1801989	1	. LEVER			
- 73	322550	1	. SCREW,BD HD- 6-32 X 0.500 LG			ATT PT
- 74	1090394	1	. WASHER,FL- 0.155 ID X 0.312 OD			ATT PT
- 75	1811021	1	. PLATE			
- 76	38235	2	. SCREW,BD HD- 6-32 X 0.312 LG			ATT PT
- 77	1821407	1	. RETAINER,CARRIER			ATT PT
- 78	38387	1	. SCREW,FIL HD- 10-32 X 0.687 LG			ATT PT
- 79	324	1	. WASHER,FL- 0.193 ID X 0.750 OD			ATT PT
- 80	1821406	1	. PLATE,PRESSURE			
- 81	1800487	1	. SPRING,FOLLOWER			
- 82	1810969	1	. FOLLOWER ASSEMBLY			
- 83	104712	1	. PIN			
- 84	38387	1	. SCREW,FIL HD- 10-32 X 0.687 LG			
- 85	324	1	. WASHER,FL- 0.193 ID X 0.750 OD			
- 86	4136975	1	. SPACER			
- 87	5214573	1	. HOUSING,MALE			
- 88	1803793	1	. EMITTER ASSEMBLY			
- 89	106419	1	. SCREW,BD HD- 10-32 X 1.750 LG			ATT PT
- 90	11596	2	. NUT,HEX- 10-32			ATT PT
- 91	2638059	1	. BUMPER			
- 92	1807647	1	. BASE ASSEMBLY,FRONT			

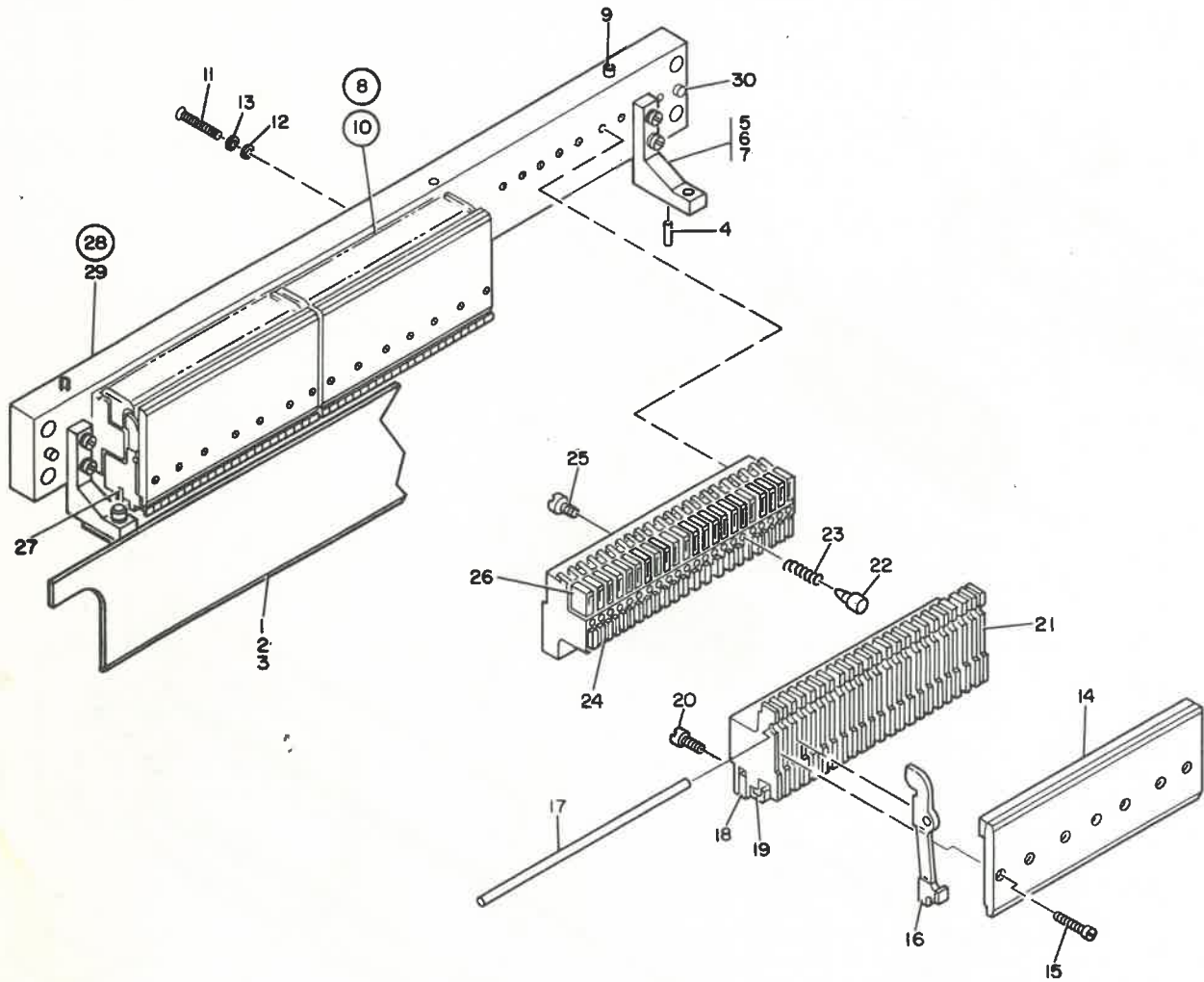


FIGURE 6. HAMMER UNIT ASSEMBLY, MODEL 1. SEE LIST 6.

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
6 -	6808520 NP	REF	FORMS GUIDE ASSEMBLY-MODEL 1 FOR NEXT HIGHER ASM SEE FIGURE 4-43 FOR ILLUSTRATION SEE FIGURE 6			
- 1	4703276 NR	1	. GUIDE			
- 2	101807	2	. SCREW,SOC HEX HD- 8-32 X 0.625 LG			ATT PT
- 3	22478	2	. WASHER,FL- 0.170 ID X 0.375 OD			ATT PT
- 4	1798805	2	. DOWEL PIN			
- 5	1794627 NR	2	. BRACKET			
- 6	5528	4	. SCREW,BD HD- 8-32 X 0.625 LG			ATT PT
- 7	22478	4	. WASHER,FL- 0.170 ID X 0.375 OD			ATT PT
- 8	1794825	1	. HAMMER UNIT ASM			
- 9	1077739	2	. PIN			
- 10	1794656	3	. BLOCK ASM			
- 11	10340	9	. . SCREW			ATT PT
- 12	22478	9	. . WASHER,FL- 0.170 ID X 0.375 OD			ATT PT
- 13	1090873	9	. . LOCKWASHER,SPLIT- 0.168 ID X 0.296 OD			ATT PT
- 14	1794800	1	. . PLATE ASM			
- 15	1794630	7	. . . SCREW,BD HD- 2-56 X 0.470 LG			ATT PT
- 16	1800707	22	. . . LEVER,HAMMER			
- 17	1800718	1	. . . SHAFT,PIVOT			
- 18	1800741	1	. . . BAR,RETAINER			
- 19	1800717	1	. . . BUMPER			
- 20	1800703	22	. . . SCREW,CAP SOC HD- 4-40 X 0.750 LG			
- 21	1754801	1	. . . COMB BAR AND PIN ASM			
- 22	1815359	22	. . . PLUNGER			
- 23	1800704	22	. . . SPRING			
- 24	1815352	1	. . . STATOR BLOCK ASM			
- 25	1132887	2	. . . SCREW,BD HD- 4-40 X 0.531 LG			
- 26	1800796	22	. . . COIL ASSEMBLY,HAMMER			
- 27	1800722	1	. . . POSITION INDICATOR			
- 28	1815358	1	. . . BAR AND PIN ASM			
- 29	1815357	1	. . . BAR,HAMMER			
- 30	104702	11	. . . PIN			

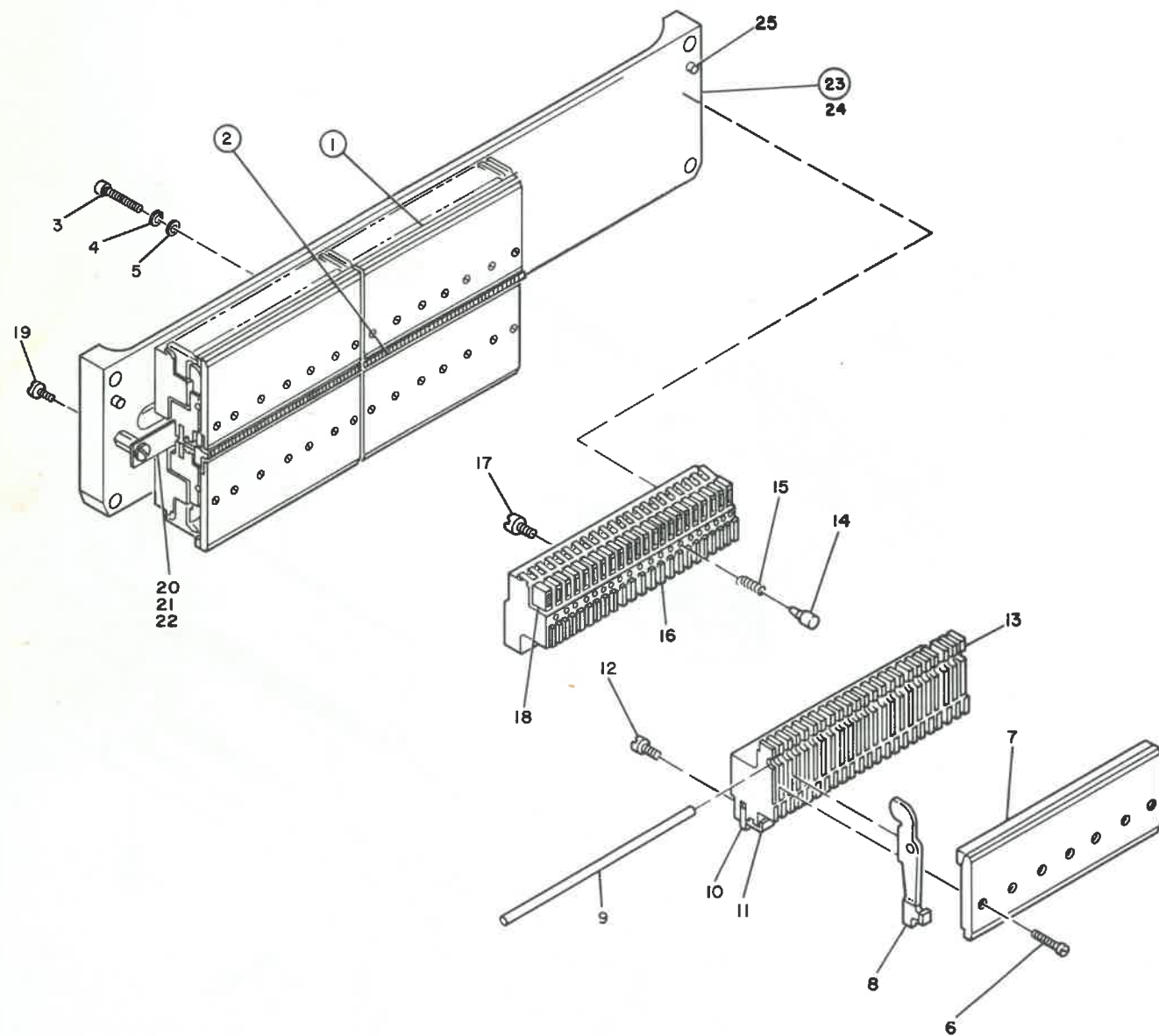


FIGURE 7. HAMMER UNIT ASSEMBLY, MODEL 2. SEE LIST 7.

# HAMMER UNIT ASSEMBLY, MODEL 2

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
7 -	1794826	REF	HAMMER UNIT ASSEMBLY, MODEL 2 FOR NEXT HIGHER ASM SEE FIGURE 4-43 FOR ILLUSTRATION SEE FIGURE 7			
- 1	1794845	3	. BLOCK ASM,22 HAMMERS-UPPER			
- 2	1794844	3	. BLOCK ASM,22 HAMMERS-ICWIR			
- 3	186931	9	. SCREW,CAP HEX SOC HD- 8-32 X 1.500 LG ATT PT			
- 4	1090873	9	. LOCKWASHER,SPLIT- 0.168 ID X 0.296 OD ATT PT			
- 5	1117437	9	. WASHER,FLAT- 0.171 ID X 0.438 OD ATT PT			
- 6	1794630	7	. . SCREW,BD HD- 2-56 X 0.470 LG			
- 7	1794779	1	. . PLATE ASSEMBLY,UPPER ATT PT			
- 7	1794761	1	. . PLATE ASSEMBLY,ICWIR			
- 8	1794815	22	. . HAMMER			
- 9	1800718	1	. . SHAFT,PIVOT			
- 10	1800741	1	. . BAR,RETAINER			
- 11	1815857	1	. . BUMPER			
- 12	1800703	22	. . SCREW,CAP SOC HD- 4-40 X 0.750 LG			
- 13	1815864	1	. . CCHB BAR AND PIN ASM			
- 14	1815359	22	. . PLUNGER			
- 15	1800704	22	. . SPRING,COMPRESSION- 15.2 COILS			
- 16	1815352	1	. . STATOR BLOCK ASM			
- 17	1132887	2	. . SCREW,BD HD- 4-40 X 0.531 LG			
- 18	1800796	22	. . COIL ASSEMBLY,HAMMER			
- 19	322552	1	. SCREW,BD HD- 6-32 X 0.875 LG ATT PT			
- 20	55726	1	. SCREW,BD HD- 6-32 X 0.188 LG			
- 21	1815929	1	. SPACER- 6-32 X 0.450 LG			
- 22	1815932	1	. LABEL			
- 23	1815865	1	. BAR AND PIN ASM			
- 24	1815859	1	. . BAR			
- 25	104701	20	. . PIN			



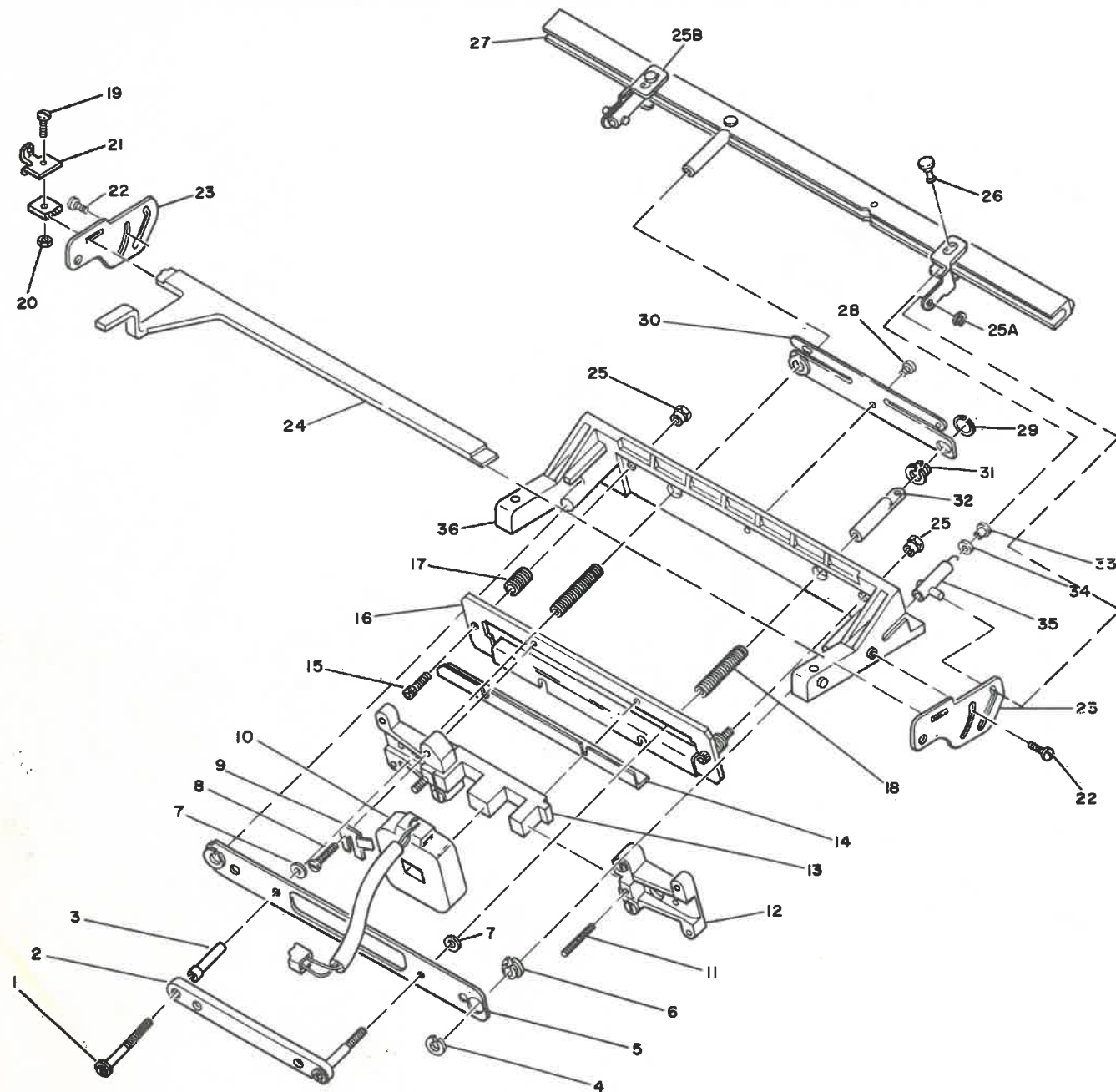
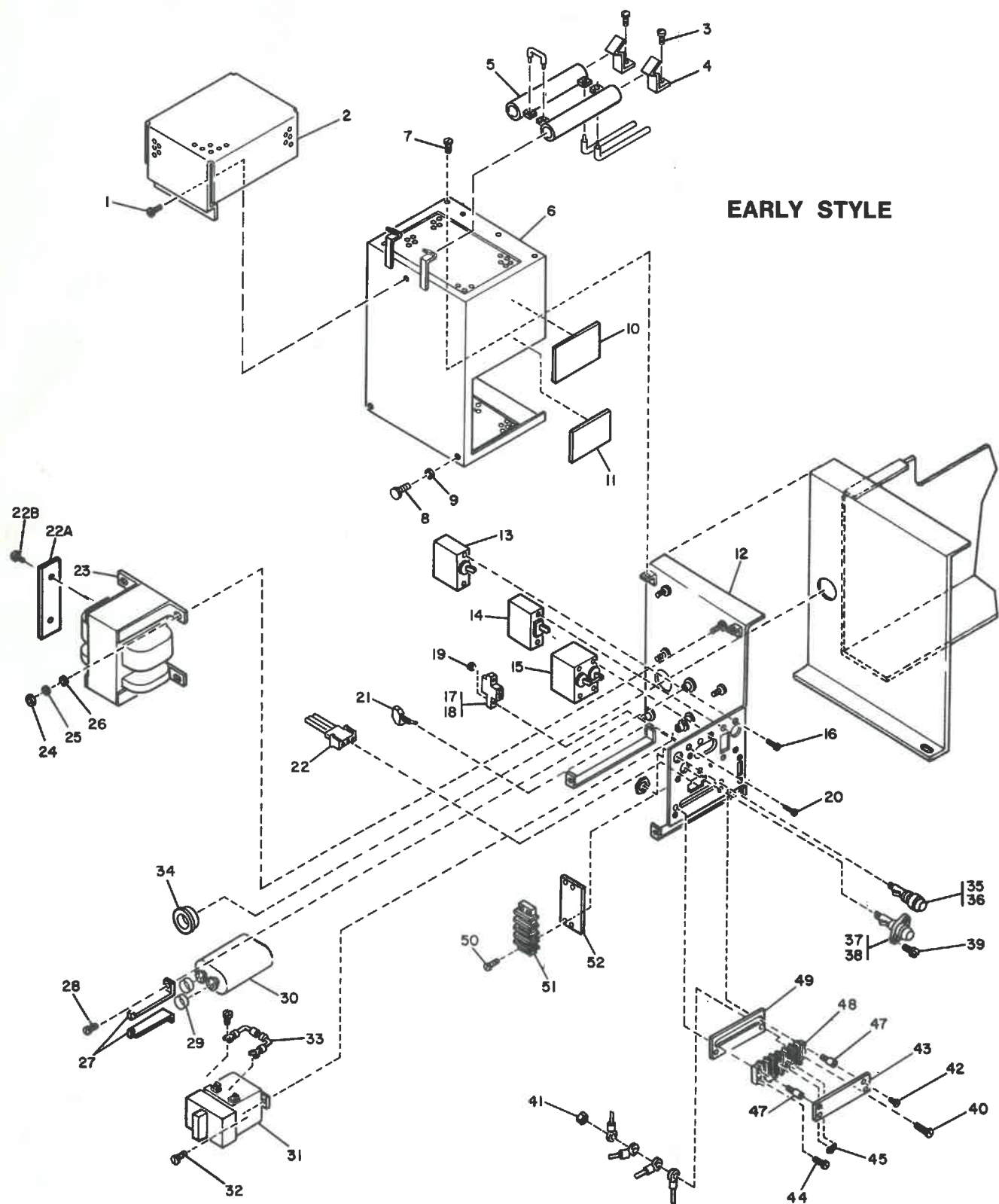


FIGURE 8. CLAMP ASSEMBLY, LOWER. SEE LIST 8.

CLAMP ASSEMBLY, LOWER

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
8 -	1794970	REF	CLAMP ASSEMBLY, LOWER FOR NEXT HIGHER ASM SEE FIGURE 4-61 FOR ILLUSTRATION SEE FIGURE 8			
- 1	1815436	2	. SCREW			
- 2	1812536	1	. ARMATURE			
- 3	1815415	2	. FERRULE			
- 4	1814644	2	. KEEPER			
- 5	1814647	1	. LOCATOR			
- 6	828310	2	. BUSHING			
- 7	5820539	2	. SPACER			
- 8	322551	4	. SCREW, BD HD- 6-32 X 0.750 LG			
- 9	1794545	1	. KEEPER			
- 10	1812547	1	. COIL ASSEMBLY			
- 11	251762	2	. SCREW			
- 12	1812621	2	. BLOCK			
- 13	1812543	1	. CORE			
- 14	1815434	2	. STIFFENER			
- 15	1794641	2	. SCREW			
- 16	1814640	1	. PLATE			
- 17	1815265	2	. SPRING			
- 18	1815433	2	. SPRING			
- 19	38235	1	. SCREW, BD HD- 6-32 X 0.312 LG			
- 20	257187	1	. NUT, HEX- 6-32			
- 21	1794638	1	. ADAPTOR			
- 22	1154943	2	. SCREW, SELF TAP- 6-20 X 0.500 LG			
- 23	1794634	2	. PLATE			
- 24	1794633	1	. LEVER			
- 25	1814641	2	. STUD, ADJUSTMENT			
- 25A	1073418	2	. RETAINER, CRANK			
- 25B	6808528	2	. RETAINER-LIMIT LINK			
- 26	1794632	4	. PIN			
- 27	1794636	1	. BAR ASM			
- 28	5784857	1	. SCREW, PAN HD- 6-20 X 0.250 LG			
- 29	1814644	2	. KEEPER			
- 30	1814648	1	. LOCATOR			
- 31	828310	2	. BUSHING			
- 32	1794631	2	. PUSHER			
- 33	1794637	2	. SPACER			
- 34	1814642	2	. BUMPER			
- 35	1794969	2	. TUBE ASSEMBLY			
- 36	1794645	1	. BLOCK			



EARLY STYLE

FIGURE 9. TRI-LEVEL POWER SUPPLY ASSEMBLY. SHEET 1 OF 2. INDEX NOS. 1-52. SEE LIST 9.

TRI-LEVEL POWER SUPPLY ASSEMBLY 50/60HZ

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
1 2 3 4			
9 -	4138420	REF	TRI-LEVEL POWER SUPPLY ASSEMBLY-50HZ
-	4138414	REF	TRI-LEVEL POWER SUPPLY ASSEMBLY-60HZ
			FOR NEXT HIGHER ASM SEE FIGURE 1-185
			FOR ILLUSTRATION SEE FIGURE 9
- 1	58207	1	SCREW,BD HD- 8-32 X 0.250 LG ATT PT
- 2	4135135	1	RESISTOR SHIELD
- 3	221790	2	SCREW,MACH BD HD- 8-32 X 0.187 LG ATT PT
- 4	2102204	2	BRACKET
- 5	2122128	2	RESISTOR,FXD 10 OHMS P/M 5% 50W
- 6	4135133	1	COVER
- 7	34512	2	SCREW,BD HD- 8-32 X 0.375 LG ATT PT
- 8	1074048	2	SCREW,MACH HEX HD 8-32 X 5/16 LG ATT PT
- 9	1090873	2	LOCKWASHER,SPLIT- 0.168 ID X 0.296 OD ATT PT
- 10	4138421	1	LABEL,FUSE
- 11	2542403	1	LABEL,FUSE WARNING
- 12	4135132	1	BASE PLATE
- 13	2281275	1	CIRCUIT BREAKER ASM,50 HZ
- 14	5214000	1	CIRCUIT BREAKER
- 15	2574126	1	CIRCUIT BREAKER
- 16	55726	8	SCREW,BD HD- 6-32 X C.188 LG ATT PT
- 17	5353851	1	CONNECTOR
- 18	5353852	3	CONTACT,FEMALE
- 19	257187	2	NUT,HEX- 6-32 ATT PT
- 20	322065	4	SCREW,BD HD- 6-32 X 0.625 LG ATT PT
- 21	5270314	1	SWITCH
- 22	1847527	1	CONNECTOR
- 22A	5236656	1	SHIELD
- 22B	10170	2	SCREW,BD HD- 6-32 X C.250 LG ATT PT
- 23	4119491	1	TRANSFORMER 50HZ
- 23	4135143	1	TRANSFORMER 60HZ
- 24	11598	4	NUT,HEX- 10-32 ATT PT
- 25	56079	4	LOCKWASHER,EXT TEETH- 0.204 ID X 0.410 O
- 26	45690	4	WASHER,FL- 0.203 ID X 0.438 OD
- 27	625955	2	BRACKET
- 28	322551	2	SCREW,BD HD- 6-32 X 0.750 LG ATT PT
- 29	526378	2	INSULATOR
- 30	5252850	1	CAPACITOR
- 31	5276701	1	CONTACTOR,MAGNETIC 24 VDC
- 32	10170	2	SCREW,BD HD- 6-32 X 0.250 LG ATT PT
- 33	2542049	1	RESISTOR,DIODE ASM WITH SPADE TERMINALS
- 34	4135138	1	GRCONNET
- 35	179946	1	HOLDER,FUSE
- 36	78999	1	FUSE
- 37	104615	1	FUSEHOLDER
- 38	107666	1	FUSE,CRTGE 15 AMF ATT PT
- 39	38352	2	SCREW,BD HD- 6-32 X 0.375 LG
- 40	438567	1	SCREW,BD HD- 6-32 X 1.000 LG
- 41	257187	1	NUT,HEX- 6-32 ATT PT
- 42	55726	1	SCREW,BD HD- 6-32 X 0.188 LG
- 43	337193	1	SHIELD,TERMINAL BOARD 6 POSITION
- 44	35739	1	SCREW,BD HD- 6-32 X 0.438 LG
- 45	367115	1	JUMPER
- 47	210883	2	STUD
- 48	502590	1	BLOCK,TERMINAL- 6 POS
- 49	8029971	1	STRIP,MARKER
- 50	35739	2	SCREW,BD HD- 6-32 X 0.438 LG ATT PT
- 51	317485	1	BLCK
- 52	527916	1	STRIP,MARKER

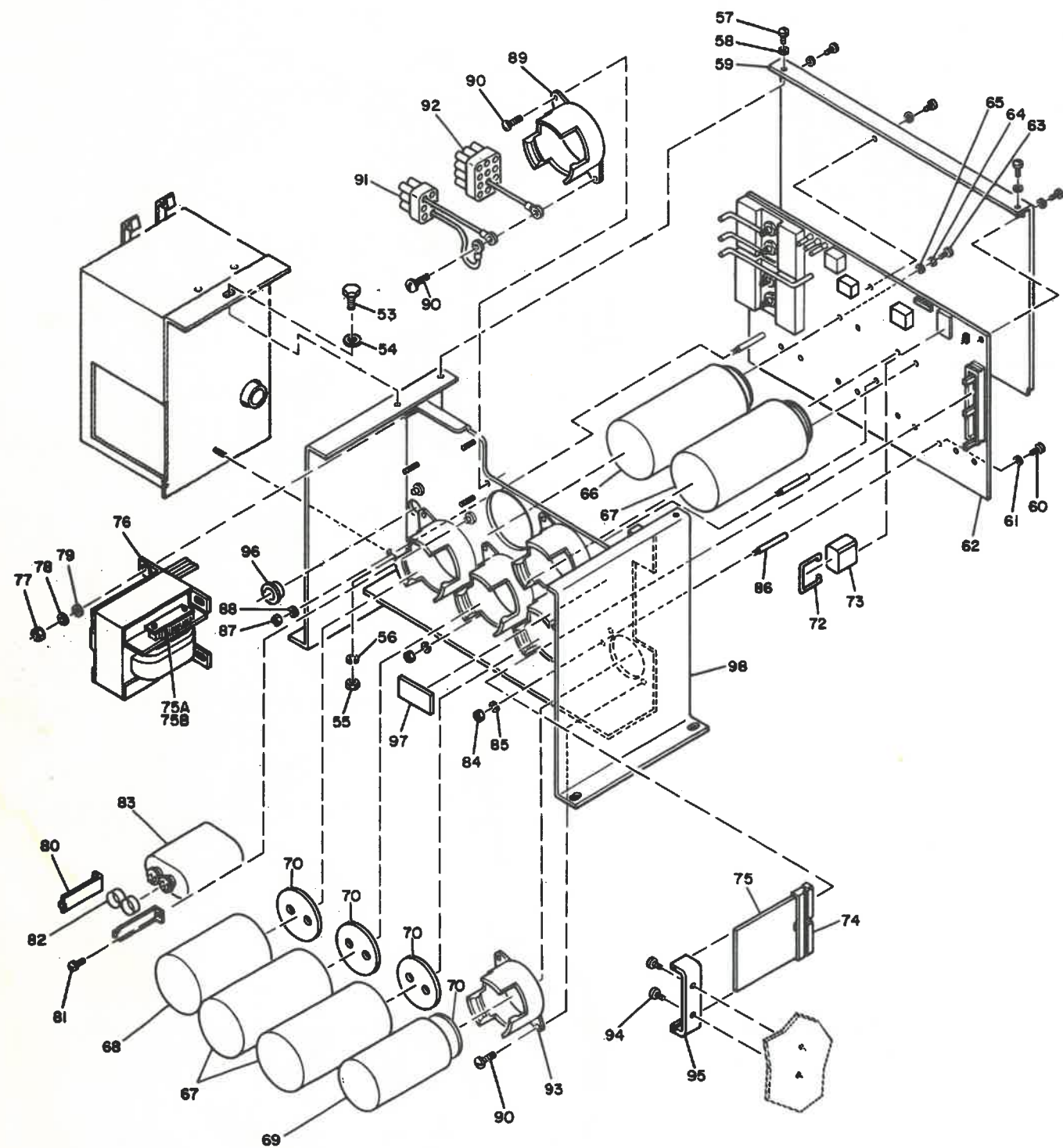
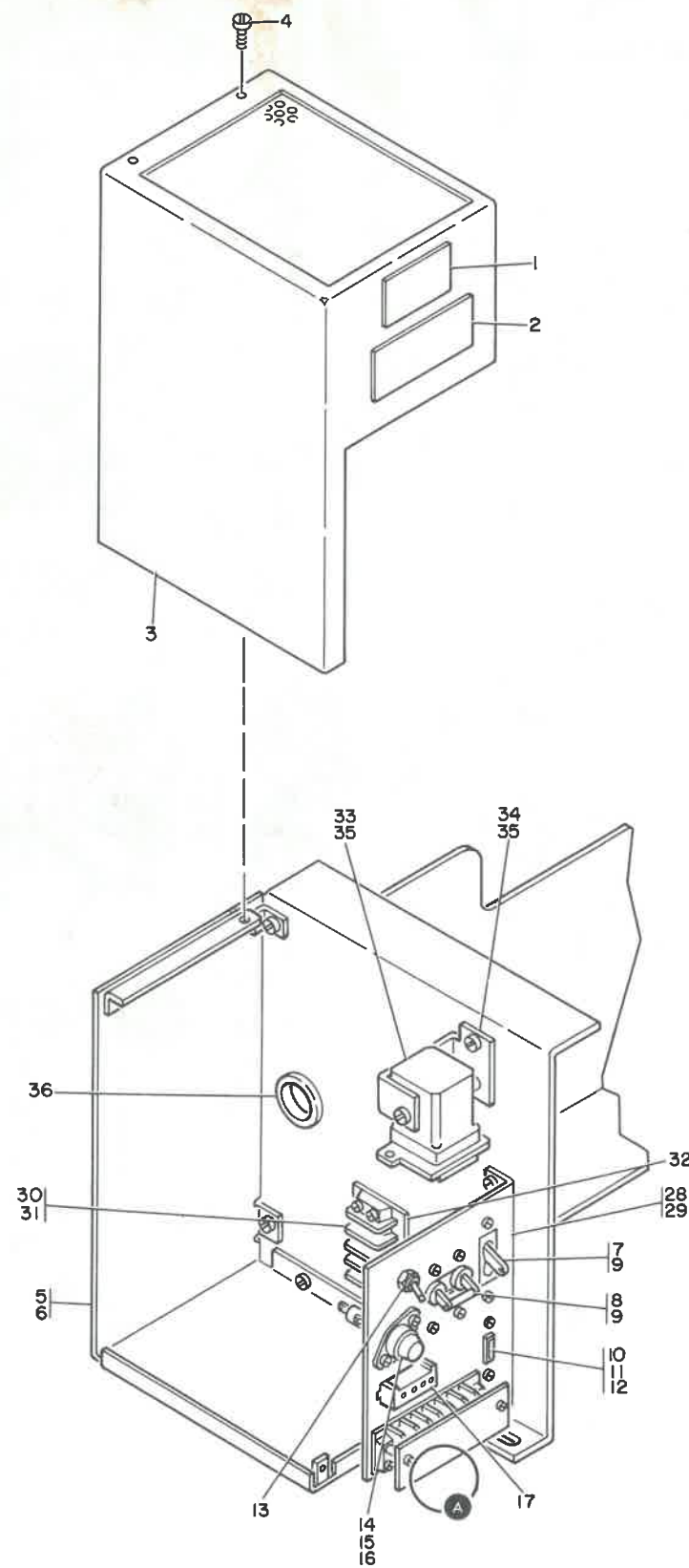


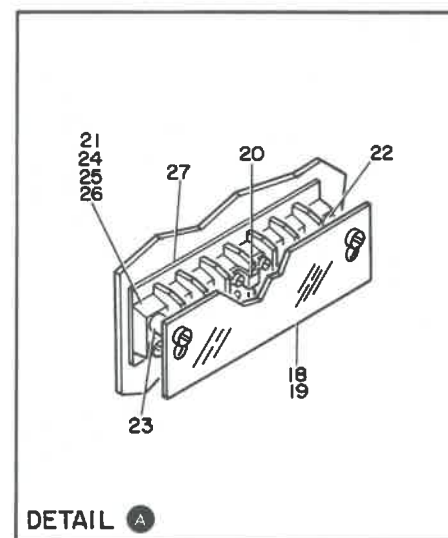
FIGURE 9. TRI-LEVEL POWER SUPPLY ASSEMBLY. SHEET 2 OF 2. INDEX NOS. 53-98. SEE LIST 9.

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION				
			1	2	3	4	
9 - 53	36844	1	. SCREW,CAP SLOT HD- 1/4-20 X 0.500 LG				ATT PT
- 54	3550	1	. WASHER,FL- 0.250 ID X 0.562 OD				
- 55	36109	1	. NUT,HEX- 1/4-20 THD				ATT PT
- 56	76574	1	. LOCKWASHER,EXT TEETH- 0.256 ID X 0.510 O				
- 57	10170	5	. SCREW,BD HD- 6-32 X 0.250 LG				ATT PT
- 58	257986	5	. WASHER,FL- 0.156 ID X 0.312 OD				ATT PT
- 59	4135134	1	. COVER				
- 60	38235	3	. SCREW,BD HD- 6-32 X 0.312 LG				ATT PT
- 61	257986	3	. WASHER,FL- 0.156 ID X 0.312 OD				ATT PT
- 62	5864584	1	. CONTROL BOARD ASM				
- 63	32042	12	. SCREW,BD HD- 10-32 X 0.375 LG				ATT PT
- 64	56079	12	. LOCKWASHER,EXT TEETH- 0.204 ID X 0.410 O				ATT PT
- 65	45690	12	. WASHER,FL- 0.203 ID X 0.438 OD				
- 66	5252526	1	. CAPACITOR,ELECTROLYIC				
- 67	5252740	3	. CAPACITOR				
- 68	5214505	1	. CAPACITOR				
- 69	5214366	1	. CAPACITOR- 24000 MF,P75M 10%				
- 70	5323562	1	. SHIELD,CAPACITOR				
- 71	631769	5	. SHIELD,CAPACITOR				
- 72	5318966	1	. RETAINER,RELAY				ATT PT
- 73	5318968	1	. RELAY				
- 74	5318968	1	. RELAY				
- 75	8525989	1	. SENSE CARD				
- 75A	5236656	1	. COVER,TERMINAL BLOCK				
- 75B	10170	2	. SCREW,BD HD- 6-32 X 0.250 LG				ATT PT
- 76	4119489	1	. TRANSFORMER 50HZ				
- 76	4135144	1	. TRANSFORMER,60 HZ				
- 77	11598	4	. NUT,HEX- 10-32				ATT PT
- 78	56079	4	. LOCKWASHER,EXT TEETH- 0.204 ID X 0.410 O				ATT PT
- 79	45690	4	. WASHER,FL- 0.203 ID X 0.438 OD				ATT PT
- 80	621446	2	. BRACKET,CAPACITOR MOUNTING				
- 81	322552	2	. SCREW,BD HD- 6-32 X 0.875 LG				ATT PT
- 82	526378	2	. INSULATOR				
- 83	5252839	1	. CAPACITOR				
- 84	257189	3	. NUT,HEX- 8-32				ATT PT
- 85	1090873	3	. LOCKWASHER,SPLIT- 0.168 ID X 0.296 OD				ATT PT
- 86	4135151	3	. STANDOFF				
- 87	36109	1	. NUT,HEX- 1/4-20				ATT PT
- 88	6935	1	. LOCKWASHER,SPLIT- 0.250 ID X 0.493 OD				ATT PT
- 89	4135153	5	. BRACKET				
- 90	34512	12	. SCREW,BD HD- 8-32 X 0.375 LG				ATT PT
- 91	5576689	1	. GROUND CONNECTOR ASM				
- 92	5576690	1	. GROUND CONNECTOR ASM				
- 93	4135152	1	. CLAMP,CAPACITOR				
- 94	10170	2	. SCREW,BD HD- 6-32 X 0.250 LG				ATT PT
- 95	4135142	1	. CARD GUIDE				
- 96	5762057	1	. GROMMET,SNAP BUSHING				
- 97	5240513	1	. P/S LABEL 50HZ				
- 97	801652	1	. P/S LABEL 60HZ				
- 98	4135131	1	. CHASSIS				





NEW STYLE



TRI-LEVEL POWER SUPPLY ASSEMBLY 50/60 HZ

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
9A-	5593470	REF	TRI-LEVEL POWER SUPPLY ASSEMBLY 50/60 HZ FOR NEXT HIGHER ASM SEE FIGURE 1-185 FOR ILLUSTRATION SEE FIGURE 9A			
- 1	2542403	1	. LABEL,FUSE WARNING			
- 2	5593492	1	. LABEL,FUSE			
- 3	5593475	1	. COVER			
- 4	316807	3	. SCREW,PH- 6-32 X 0.375 LG			
- 5	5593476	1	. COVER,BOTTOM			ATT PT
- 6	10170	4	. SCREW,BD HD- 6-32 X 0.250 LG			ATT PT
- 7	5214000	1	. CIRCUIT BREAKER			
- 8	2574126	1	. CIRCUIT BREAKER			
- 9	55726	6	. SCREW,BD HD- 6-32 X 0.188 LG			ATT PT
- 10	5593482	1	. CABLE ASM-POWER SUPPLY TC FAN FOR COMPONENT PARTS SEE FIGURE 12			
- 11	322065	2	. SCREW,BD HD- 6-32 X 0.625 LG			ATT PT
- 12	257187	2	. NUT,HEX- 6-32			ATT PT
- 13	5270314	1	. SWITCH			
- 14	107666	1	. FUSE,CRTGE 15 AMP			
- 15	104615	1	. FUSEHOLDER			
- 16	38352	2	. SCREW,BD HD- 6-32 X 0.375 LG			ATT PT
- 17	5593483	1	. CABLE ASM-POWER SUPPLY TC TRANSFORMER FOR COMPONENT PARTS SEE FIGURE 12			
- 18	337193	1	. SHIELD,TERMINAL BLOCK 6 POSITION			
- 19	55726	2	. SCREW,BD HD- 6-32 X 0.188 LG			ATT PT
- 20	367115	1	. JUMPER,TERMINAL STRIP			
- 21	502590	1	. BLOCK,TERMINAL- 6 POS			
- 22	210883	1	. STUD			ATT PT
- 23	210884	1	. STUD			ATT PT
- 24	35739	1	. SCREW,BD HD- 6-32 X 0.438 LG			ATT PT
- 25	438567	1	. SCREW,BD HD- 6-32 X 1.000 LG			ATT PT
- 26	257187	1	. NUT,HEX- 6-32			ATT PT
- 27	8029971	1	. STRIP,MARKER			
- 28	5593485	1	. PANEL-PRIMARY POWER			
- 29	10170	2	. SCREW,BD HD- 6-32 X 0.250 LG			ATT PT
- 30	4703277	1	. BLOCK,TERMINAL			
- 31	322550	4	. SCREW,BD HD- 6-32 X 0.500 LG			ATT PT
- 32	527916	1	. STRIP,MARKER			
- 33	2242321	1	. RELAY			
- 34	5593479	1	. BRACKET			
- 35	10170	3	. SCREW,BD HD- 6-32 X 0.250 LG			ATT PT
- 36	4135138	1	. GROUNDING			

FIGURE 9A. TRI-LEVEL POWER SUPPLY ASSEMBLY. SHEET 1 OF 2. INDEX NOS. 1-36. SEE LIST 9A.

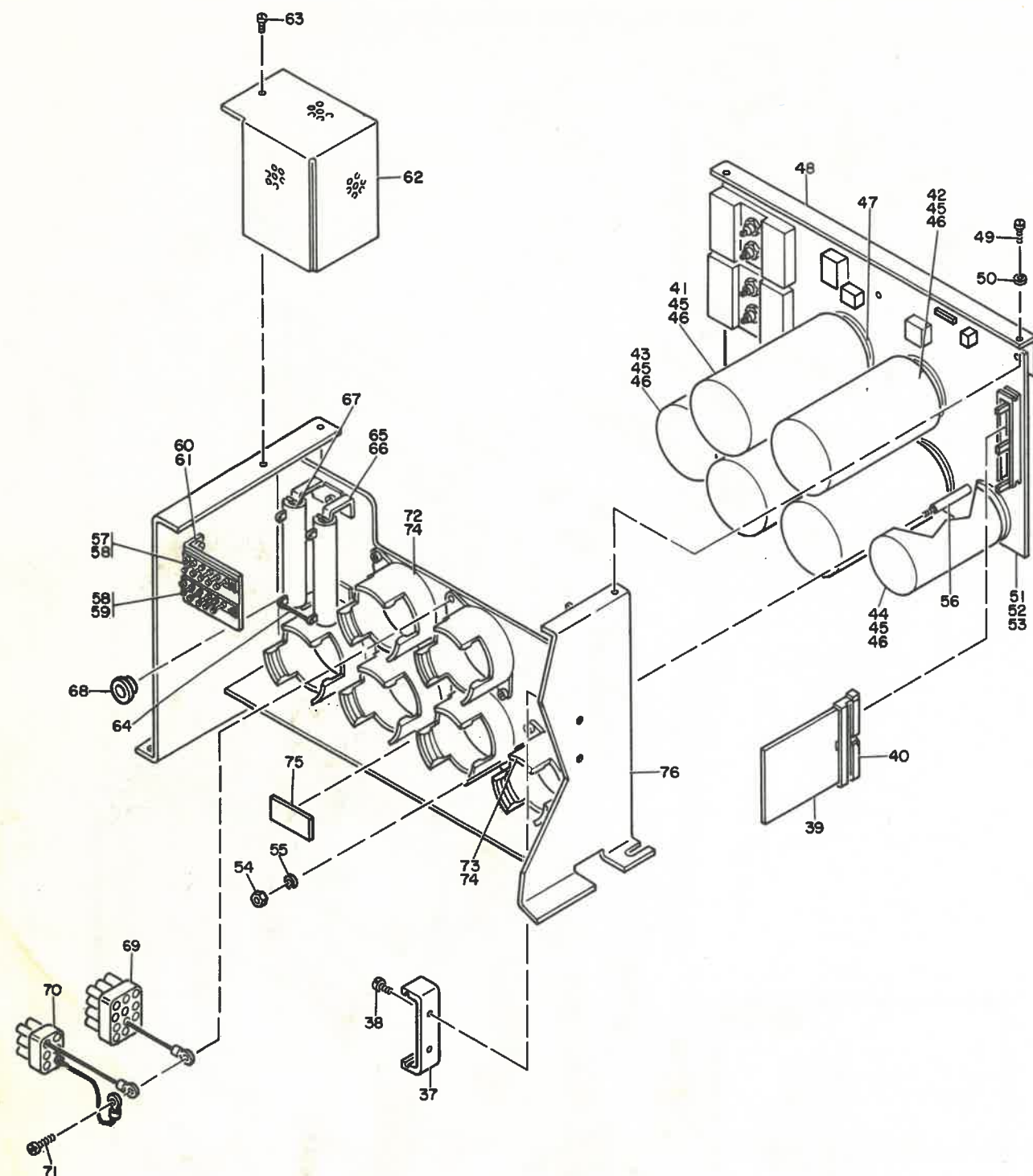


FIGURE 9A. TRI-LEVEL POWER SUPPLY ASSEMBLY. SHEET 2 OF 2. INDEX NOS. 37-76. SEE LIST 9A.

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
9A- 37	4135142	1	. CARD GUIDE			
- 38	10170	2	. SCREW, BD HD- 6-32 X 0.250 LG			
- 39	8525989	1	. SENSE CARD			
- 40	811804	1	. GUIDE, CARD			
- 41	5252526	1	. CAPACITOR, ELECTROLYIC			
- 42	5252740	3	. CAPACITOR			
- 43	5214505	1	. CAPACITOR			
- 44	5214073	1	. CAPACITOR			
- 45	32042	12	. SCREW, BD HD- 10-32 X 0.375 LG			
- 46	2125974	12	. SPACER			
- 47	631769	5	. SHIELD, CAPACITOR			
- 47	5325562	1	. SHIELD, CAPACITOR-USED WITH CAP 5214073			
- 48	5593477	1	. BRACKET			
- 49	10170	5	. SCREW, BD HD- 6-32 X 0.250 LG			
- 50	257986	5	. WASHER, FL- 0.156 ID X 0.312 OD			
- 51	5593490	1	. BOARD ASM			
- 52	38235	3	. SCREW, BD HD- 6-32 X 0.312 LG			
- 53	257986	3	. WASHER, FL- 0.156 ID X 0.312 OD			
- 54	1090873	3	. LOCKWASHER, SPLIT- 0.168 ID X 0.296 OD			
- 55	257189	3	. NUT, HEX- 8-32			
- 56	4135151	3	. STANDOFF			
- 57	5593488	1	. CABLE ASM-TEST POINT			
- 58	5593489	1	. CABLE ASM-TEST POINT			
- 59	43854E	4	. FOR COMPONENT PARTS SEE FIGURE 12A			
- 60	5593486	1	. SCREW, BD HD- 4-40 X 0.188 LG			
- 61	10170	2	. BRACKET-TEST POINT MOUNTING			
- 62	5593478	1	. SCREW, BD HD- 6-32 X 0.250 LG			
- 63	38235	1	. COVER, RESISTOR			
- 64	103079	1	. SCREW, BD HD- 6-32 X 0.312 LG			
- 65	5593484	1	. WIRE BARE			
- 66	38235	2	. BRACKET			
- 67	2122128	2	. SCREW, BD HD- 6-32 X 0.312 LG			
- 68	4135138	1	. RESISTOR, FXD 10 OHMS P/M 5% 50W			
- 69	5576690	1	. GROMMET			
- 70	5576689	1	. GROUND CONNECTOR ASM			
- 71	81693	1	. GROUND CONNECTOR ASM			
- 72	4135153	5	. SCREW, BD HD- 6-32 X 0.375 LG			
- 73	4135152	1	. CLAMP			
- 74	81693	1	. CLAMP USED WITH SHIELD 5323562			
- 75	801652	11	. SCREW, BD HD- 6-32 X 0.375 LG			
- 76	5593474	1	. LABEL			
			. CHASSIS			

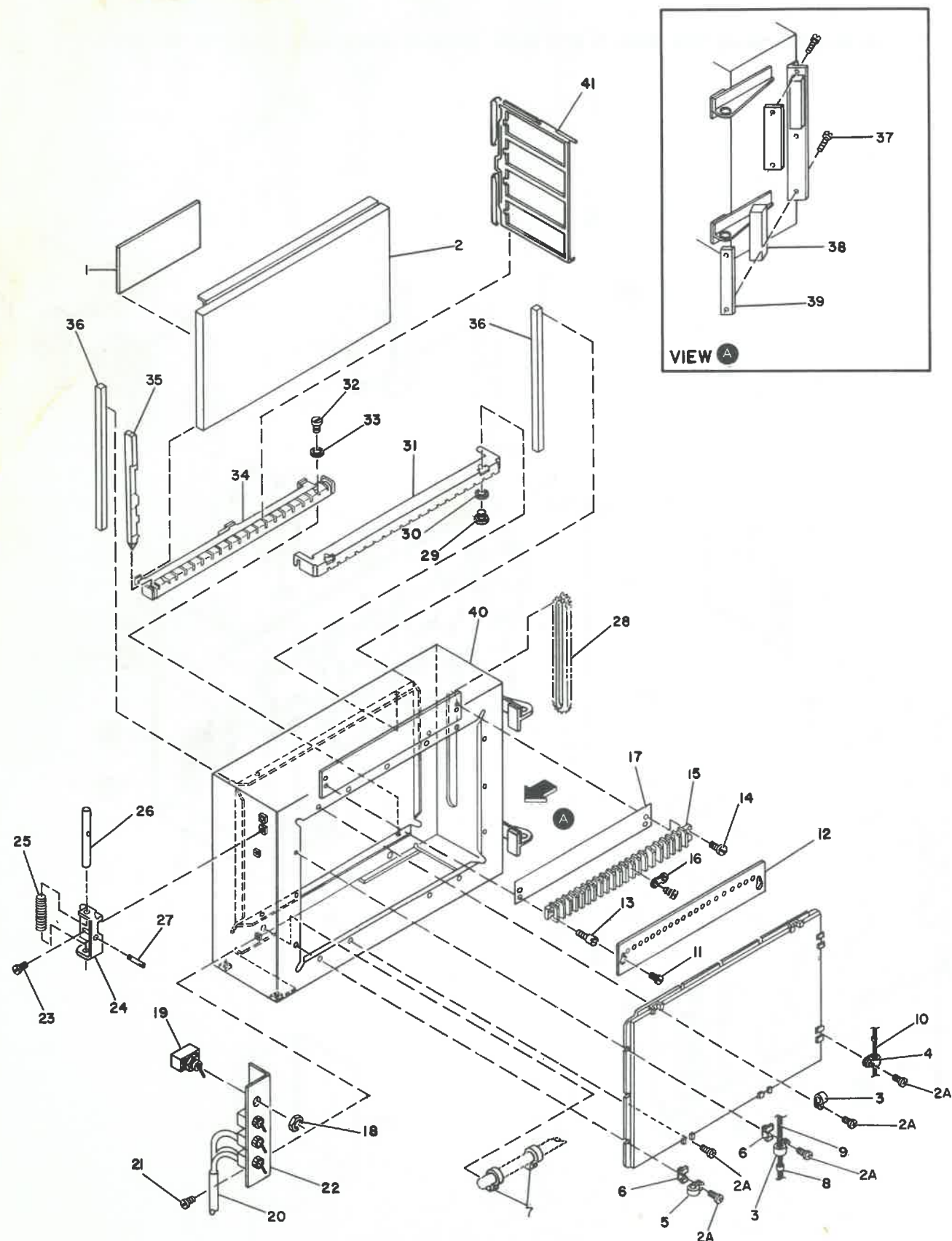


FIGURE 10. LOGIC CHASSIS ASSEMBLY. SEE LIST 10.

# LOGIC CHASSIS ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
10 -	1819740	REF	LOGIC CHASSIS ASSEMBLY FOR NPYT HIGHER ASSEMBLY SEE FIGURE 2-66 FOR ILLUSTRATION SEE FIGURE 10
- 1	2648906	1	. LABEL
- 2	68C8541	1	. COVER ASM
- 2A	811417	8	. SCREW, HEX SOCKET HD 6-32 X 0.500 LG
- 3	804109	4	. CLAMP
- 4	2102364	1	. CLAMP
- 5	2102364	1	. CLAMP
- 6	813179	8	. CLAMP
- 7	2162907	2	. CLAMP
- 8	524519	8	. TIE, CABLE
- 9	4138334	1	. CABLE ASM FOR COMPONENT PARTS SEE FIGURE 12
- 10	5576691	1	. CABLE ASM FOR COMPONENT PARTS SEE FIGURE 12
- 11	10170	2	. SCREW
- 12	5824095	1	. COVER
- 13	210883	2	. STUD
- 14	322550	2	. SCREW
- 15	25322C	1	. TERMINAL STRIP
- 16	367115	12	. TERMINAL STRIP
- 17	242260	1	. MARKER STRIP
- 18	179743	4	. NUT, HEX, TOGGLE SW HLDG-0.469-32
- 19	738827	4	. SWITCH
- 20	5593453	1	. CABLE ASM FOR COMPONENT PARTS SEE FIGURE 12
- 21	58207	2	. SCREW
- 22	4135069	1	. BRACKET
- 23	34512	2	. SCREW
- 24	1796730	1	. HOUSING
- 25	220856	1	. SPRING
- 26	204499	1	. PIN, GATE LATCH
- 27	204500	1	. STUD- 8-32 X 1.375 LG
- 28	825880	1	. TAPE, FOAM
- 29	811417	2	. SCREW
- 30	257986	2	. WASHER
- 31	819268	1	. UPPER GUIDE
- 32	811417	2	. SCREW
- 33	257986	2	. WASHER
- 34	819269	1	. LOWER GUIDE
- 35	819284	2	. INTERMIX BRACKETS
- 36	817905	2	. SEAL
- 37	186933	4	. SCREW
- 38	5593416	4	. MAT
- 39	5593415	2	. PLATE
- 40	1819766	1	. PLATE
- 41	818002	AR	. GUIDE, CARD- 3 HIGH 2 WIDE
- 41	819408	AR	. GUIDE, CARD- 3 HIGH 4 WIDE
- 41	2766709	AR	. GUIDE, CARD- 3 HIGH 4 WIDE WITH TCP CONN



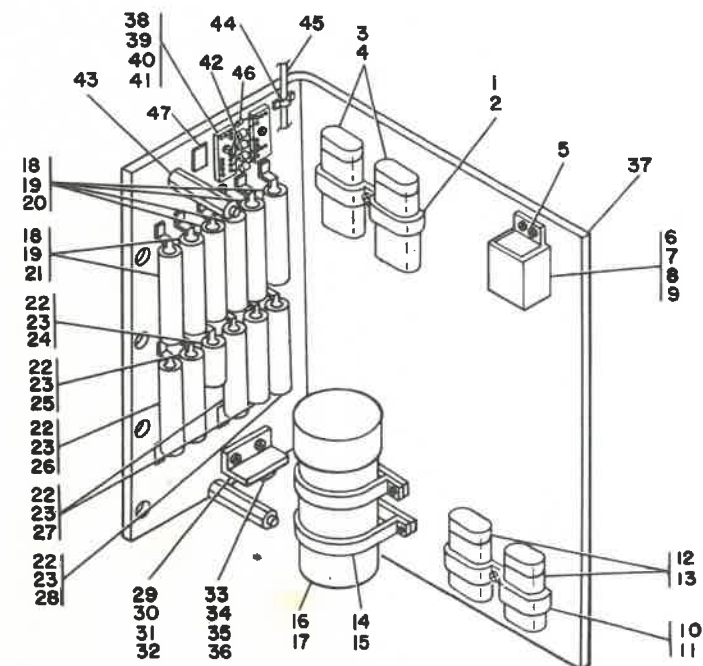


FIGURE 11. POWER PLATE ASSEMBLY. SEE LIST 11.

POWER PLATE ASSEMBLY

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
11 -	1819731	REF	POWER PLATE ASSEMBLY FOR NEXT HIGHER ASSEMBLY SEE FIGURE 2-83 FOR ILLUSTRATION SEE FIGURE 11
- 1	58207	1	. SCREW,BD HD- 8-32 X 0.250 LG
- 2	1811047	1	. CLAMP
- 3	5252809	6	. CAPACITOR,8.0 MFD
- 4	363001	1	. BOCT
- 5	58207	2	. SCREW,BD HD- 8-32 X 0.250 LG
- 6	1811048	1	. BRACKET,SWITCH
- 7	2410111	1	. RELAY, 245 OHMS 24VDC
- 8	52684	4	. SCREW,BD HD- 3-48 X 0.125 LG
- 9	1812598	1	. COVER
- 10	186759	1	. SCREW,BD HD- 8-32 X 0.312 LG
- 11	4703211	1	. CLAMP
- 12	5252810	1	. CAPACITOR,PAPER AC- 10 MFD 330 VACW
- 13	363001	1	. BOCT
- 14	58207	2	. SCREW,BD HD- 8-32 X 0.250 LG
- 15	4135005	2	. CLAMP
- 16	5252740	1	. CAPACITOR
- 17	4135099	1	. COVER
- 18	58207	1	. SCREW,BD HD- 8-32 X 0.250 LG
- 19	510316	2	. BRACKET
- 20	5615309	1	. RESISTOR
- 21	5615879	1	. RESISTOR
- 22	58207	2	. SCREW,BD HD- 8-32 X 0.250 LG
- 23	510316	2	. BRACKET
- 24	507142	1	. RESISTOR,100 OHMS 25W
- 25	5615311	1	. RESISTOR
- 26	5615311	1	. RESISTOR
- 27	5615309	1	. RESISTOR
- 28	5615592	1	. RESISTOR
- 29	34512	2	. SCREW,BD HD- 8-32 X 0.375 LG
- 30	1819757	1	. BRACKET
- 31	300606	2	. WASHER,INSULATING- 0.169 ID X 0.437 OD
- 32	1073412	2	. INSULATOR
- 33	81693	2	. SCREW,BD HD- 6-32 X 0.375 LG
- 34	62031	2	. LOCKWASHER,INT TEETH- 0.150 ID X 0.295 OD
- 35	257187	2	. NUT,HEX- 6-32
- 36	369649	1	. SEMICONDUCTOR DEVICE,DIODE TYPE FN
- 37	1819730	1	. PLATE
- 38	438549	2	. SCREW,BD HD- 4-40 X 0.437 LG
- 39	205331	3	. JUMPER
- 40	302131	2	. STRIP,INSULATOR 2.094 LG
- 41	302090	2	. BLOCK,TERMINAL
- 42	639292	4	. RESISTOR,WIREWOUND- 100 OHMS 10W
- 43	801731	2	. HEX STANDOFF
- 44	524519	3	. TIE,CABLE
- 45	1815152	1	. CABLE ASM
- 46	615354	1	. DIODE ASSEMBLY,AM
- 47	5593422	1	. LABEL

CABLE AND JUMPER ASM COMPONENT PARTS

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
12 -	1815065	REF	CABLE ASM, AC I/O FOR COMPONENT PARTS SEE INDEXES -6 AND -24			
-	1815066	REF	CABLE ASM, DC I/O FOR COMPONENT PARTS SEE INDEXES -8,-9, -10,-11 AND -18			
-	1815152	REF	CABLE ASM, DC TO MOTORS FOR COMPONENT PARTS SEE INDEXES 3,3A,4, -7,-8,-9,-12,-13,-15,-16,-17,-18,-20, -21,-22,-23,-27,-31,-32,-36,-57 AND -58			
-	1819735	REF	CABLE ASM, CORD-ATTACHMENT FOR COMPONENT PARTS SEE INDEXES -10 AND -28			
-	4134969	REF	CABLE ASM, AC SW TO POWER SUPPLY FOR COMPONENT PARTS SEE INDEX -8			
-	4134970	REF	CABLE ASM, DC INTERNAL +24V,+8.5V,+5VDC FOR COMPONENT PARTS SEE INDEXES -8, -9,-25,-26 AND -59			
-	4135102	REF	CABLE ASM, POWER SUPPLY SIGNAL FOR COMPONENT PARTS SEE INDEXES -16, -19,-29,-35,-36,-48 AND -71			
-	4138334	REF	CABLE ASM FOR COMPONENT PARTS SEE INDEXES -37, -38,-39,-40,-41,-42 AND -43			
-	4138336	REF	CABLE ASM, PS TO GATE FAN FOR COMPONENT PARTS SEE INDEXES -24, -33 AND -34			
-	4138338	REF	CABLE ASM, AC LINE FLR TO PS FOR COMPONENT PARTS SEE INDEXES -8 AND -10			
-	5576641	REF	CABLE ASM, CONVENIENCE OUTLET 60HZ FOR COMPONENT PARTS SEE INDEXES -1, -2,-8,-14,-51,-74,-75,-76 AND -77			
-	5576678	REF	CABLE ASM, CORD-ATTACHMENT-UTC FOR COMPONENT PARTS SEE INDEX -10			
-	5576689	REF	GROUND CONNECTOR ASM 8.5V AND 5V FOR COMPONENT PARTS SEE INDEXES -25 AND -30			
-	5576690	REF	GROUND CONNECTOR ASM 25V AT 15A FOR COMPONENT PARTS SEE INDEXES -26 AND -30			
-	5576691	REF	CABLE ASM FOR COMPONENT PARTS SEE INDEX -8			
-	1815149	REF	CABLE ASM, HAMMER MAGNETS-UPPER BANK FOR COMPONENT PARTS SEE INDEXES -3A,-45,-46,-47,-48,-49 AND -50			
-	1815150	REF	CABLE ASM, HAMMER MAGNETS-LOWER BANK FOR COMPONENT PARTS SEE INDEXES -3A,-45 -46,-47,-48,-49 AND -50			
-	1815151	REF	CABLE ASM, SIGNAL FOR COMPONENT PARTS SEE INDEXES -3,-16, -31,-35,-36,-53,-54,-55 AND -56			
-	4134971	REF	CABLE ASM, SIGNAL I/C FOR COMPONENT PARTS SEE INDEXES -16,-17, -36,-58,-60,-61,-62,-63,-64,-65,-66,-67, -68,-69 AND -70			
-	4135130	REF	CABLE ASM, CORD-ATTACHMENT-1828.8 FOR COMPONENT PARTS SEE INDEXES -10, AND -28			
-	5576620	REF	CABLE ASM, OP PANEL TO LOGIC GATE FOR COMPONENT PARTS SEE INDEXES -16,-17, -19,-32,-36,-54 AND -71			
-	5576687	REF	CABLE ASM,OUTLET-50 HZ FOR COMPONENT PARTS SEE INDEXES -1,-2, -8,-12,-51,-52,-72,-74 AND -75			
-	5593412	REF	CABLE ASM,HAMMER UNIT 25 VOLT FOR COMPONENT PARTS SEE INDEXES -9 AND -11			
-	5593453	REF	CABLE ASM,FE SWITCHES FOR COMPONENT PARTS SEE INDEXES -17,-32, -36,-54 AND -73			
-	5593482	REF	CABLE ASM-FAN TO POWER SUPPLY FOR COMPONENT PARTS SEE INDEXES -7A,-18 -33A AND -34A			
-	5593483	REF	CABLE ASM-TRANSFORMER TO POWER SUPPLY FOR COMPONENT PARTS SEE INDEXES -11A,-18 AND -24A			

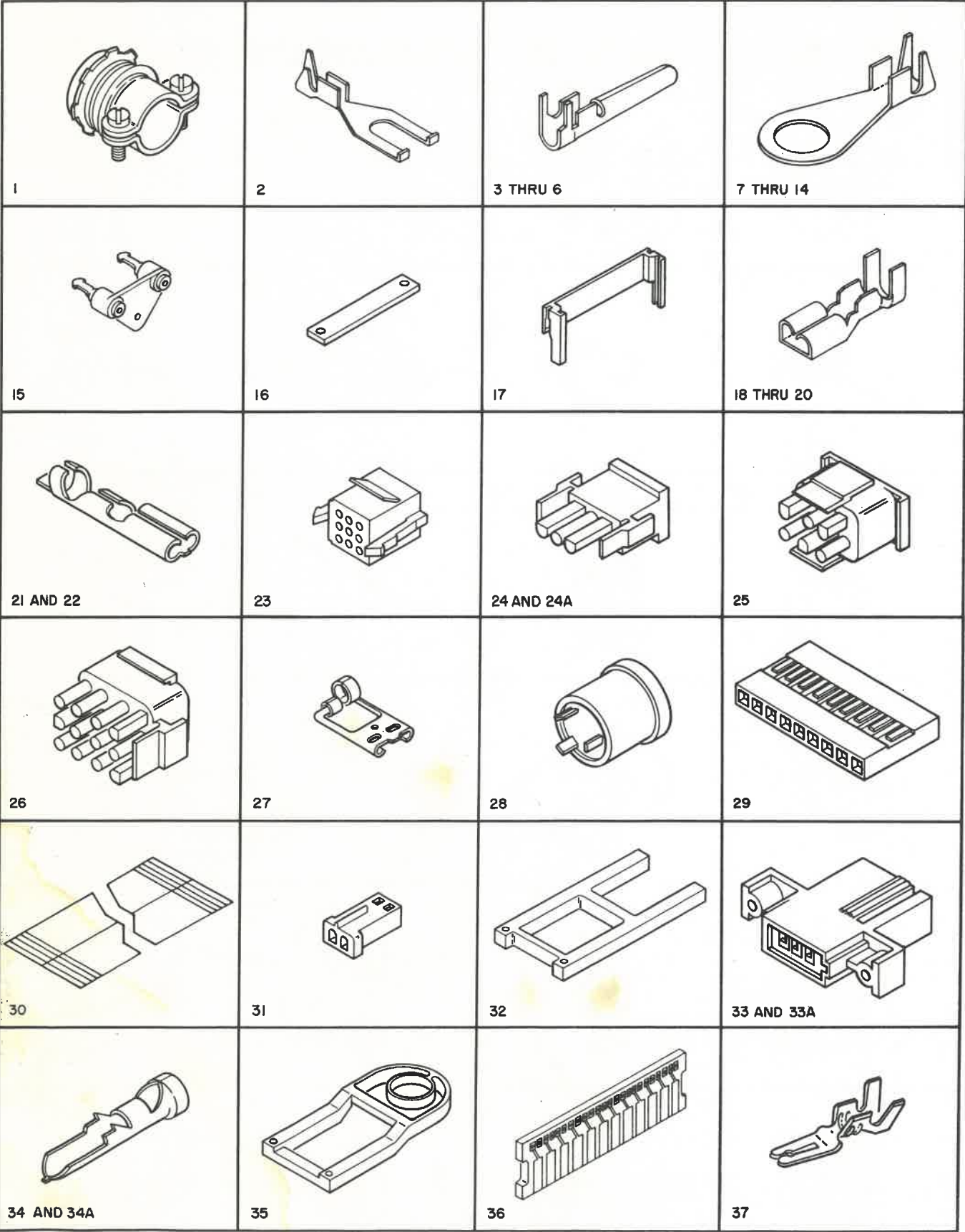


FIGURE 12. CABLE AND JUMPER ASSEMBLY COMPONENT PARTS. SHEET. 1 OF 3. INDEX NOS. 1-37. SEE LIST 12.

CABLE AND JUMPER ASM COMPONENT PARTS

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
12 -	5593488	REF	CABLE ASM-TEST POINT FOR COMPONENT PARTS SEE INDEXES -44 AND -54
-	5593489	REF	CABLE ASM-TEST POINT FOR COMPONENT PARTS SEE INDEXES -44 AND -54
- 1	151598	AR	CLAMP
- 2	483652	AR	TERMINAL, FLANGED SPACE- 14-16AWG
- 3	483657	AR	TERMINAL, TAPER PIN
- 3A	483658	AR	TERMINAL, TAPER PIN 18-20 AWG
- 4	483659	AR	TERMINAL, TAPER PIN- 22-26AWG
- 5	1847521	AR	TERMINAL, SOCKET
- 6	1471019	AR	TERMINAL, TAPER PIN
- 7	483676	AR	TERMINAL, RING- 22-26 AWG
- 7A	483677	AR	TERMINAL, RING, NO. 6 STUD, 18-20 AWG
- 8	483678	AR	TERMINAL, RING 14-16 AWG
- 9	483679	AR	TERMINAL, RING 10-12 AWG
- 10	483682	AR	TERMINAL, RING 14-16 AWG
- 11	483683	AR	TERMINAL, RING 10-12 AWG
- 11A	483685	AR	TERMINAL, RING, NO. 10 STUD, 18-20 AWG
- 12	483686	AR	TERMINAL, RING 14-16 AWG
- 13	483687	AR	TERMINAL, RING 10-12 AWG
- 14	483689	AR	TERMINAL, RING- 14-16AWG
- 15	725506	AR	SOCKET, TRANSISTOR
- 16	740459	AR	STIFFENER
- 17	811802	AR	CARD GUIDE
- 18	1127037	AR	TERMINAL, WIRE
- 19	2637682	AR	CONNECTOR, WIRE (22 26 AWG)
- 20	430799	AR	RECEPTACLE-TERMINAL
- 21	1166115	AR	SOCKET
- 22	5412817	AR	TERMINAL
- 23	1166498	AR	HOUSING
- 24	1847526	AR	CONNECTOR
- 24A	1847529	AR	CONNECTOR-4 POSITION
- 25	1847530	AR	PLUG
- 26	1847534	AR	PLUG
- 27	2162590	AR	TERMINAL, FLAG FAST
- 28	2594755	AR	CONNECTOR
- 29	2731852	AR	HOUSING
- 30	4135136	AR	LABEL, CONNECTOR
- 31	5214572	AR	HOUSING, CONNECTOR- FEMALE
- 32	2744813	AR	INSULATOR
- 33	5353853	AR	HOUSING, CONNECTOR
- 33A	5353851	AR	HOUSING, CONNECTOR
- 34	5353854	AR	CONTACT, MALE 16-20 WIRE
- 34A	5353852	AR	CONTACT, MALE
- 35	4124485	AR	STRAIN RELIEF
- 35	5353922	AR	STRAIN REL
- 36	5800634	AR	CARD ASM
- 37	813194	AR	TERMINAL



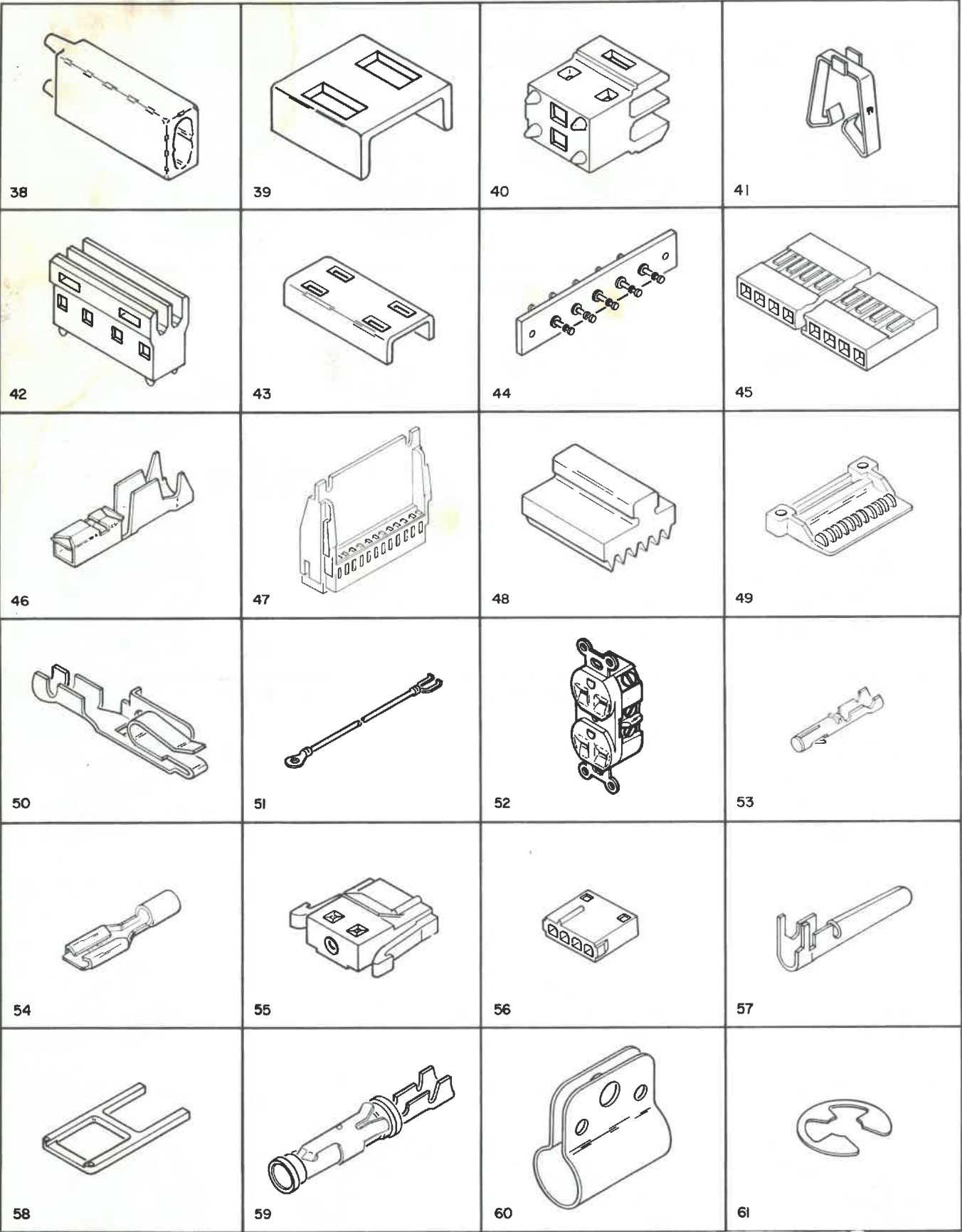


FIGURE 12. CABLE AND JUMPER ASSEMBLY COMPONENT PARTS. SHEET 2 OF 3. INDEX NOS. 38-61. SEE LIST 12.

CABLE AND JUMPER ASSEMBLY COMPONENT PARTS

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
12 - 38	813197	AR	1 HOUSING
- 39	813549	AR	2 COVER
- 40	813550	AR	3 HOUSING
- 41	813681	AR	4 CONTACT
- 42	813801	AR	1 HOUSING
- 43	813802	AR	1 COVER,VOLTAGE CROSSOVER
- 44	5593487	AR	1 STRIP,TURRET
- 45	1800735	AR	1 HOUSING
- 46	1794724	AR	1 TERMINAL
- 47	5447741	AR	1 HOUSING,SINGLE HI
- 48	5466393	AR	1 CLAMP,STRAIN RELIEF
- 49	5466397	AR	1 STRAIN RELIEF
- 50	5486851	AR	1 CONTACT,SERPENT-SINGLE HI,22-26 BNG
- 53	2513254	AR	1 TERMINAL,SOCKET- 30-32 AWG
- 54	236916	AR	1 TERMINAL,CONTACT- FEMALE 24-22 AWG
- 55	1166116	AR	1 HOUSING
- 56	1812491	AR	1 HOUSING,FEMALE CONTACTS
- 57	483661	AR	1 TERMINAL
- 58	2744614	AR	1 STRAIN RELIEF
- 59	1471028	AR	1 CONTACT
- 60	4037302	AR	1 CLAMP
- 61	264641	AR	1 RING,RETAINING EXT 0.114 ID X 0.025 THK

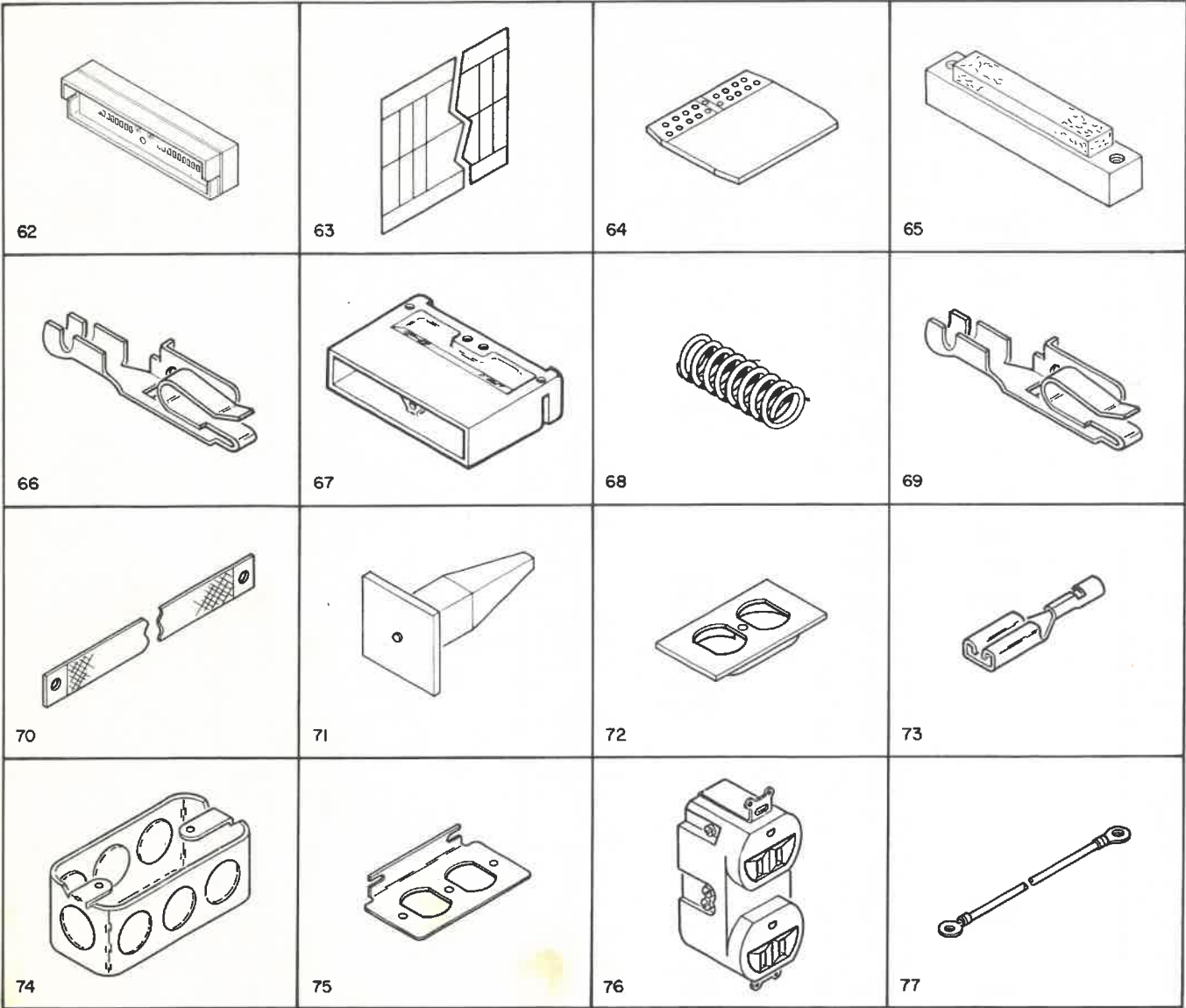


FIGURE 12. CABLE AND JUMPER ASSEMBLY COMPONENT PARTS. SHEET 3 OF 3. INDEX NOS. 62-77. SEE LIST 12.

CABLE AND JUMPER ASM COMPONENT PARTS

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
12 - 62	5353868	AR	.	CONNECTOR BLOCK,B-STYLE		
- 63	483770	AR	.	LABEL		
- 64	5353880	AR	.	CARD,SHIELD COMMONING		
- 65	5353896	AR	.	RELIEF ASSEMBLY,STRAIN		
- 66	5362301	AR	.	CONTACT,LARGE SERPENT,22-26 WIRE RANGE		
- 67	5362306	AR	.	COVER,CONNECTOR BLOCK		
- 68	1105806	AR	.	SPRING		
- 69	5404480	AR	.	CONTACT,GREAT SNAKE,18-20 WIRE RANGE		
- 70	2101840	AR	.	STRAP		
- 71	2637689	AR	.	INSERT		
- 74	194355	AR	.	OUTLET BOX		
- 75	4703239	AR	.	BRACKET		
- 76	357995	AR	.	OUTLET,CONV 115V 60 HZ		
- 77	1993937	AR	.	JUMPER ASM		

# NUMERICAL INDEX

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1815487	4 - 57A		1 - 93		9A- 73	4703265	3 -115A
1815488	4 - 53		1 - 94	4135153	9 - 89	4703266	3A- 12
1815489	4 - 55		1 -103		9A- 72	4703267	3A- 12
1815490	4 - 57C		1 -222	4136961	5 - 9	4703268	3A- 12
1815492	4 - 57		1 -223	4136975	5 - 86	4703269	3A- 12
1815929	7 - 21	2542049	9 - 33	4138326	2 -115	4703270	3A- 1
1815932	7 - 22	2542403	9 - 11	4138327	1 -150	4703271	3A- 1
1816025	4 - 19		9A- 1	4138334	10 - 9	4703273	3A- 1
1816026	4 - 17	2574126	9 - 15		12 - REF		3A- 1
1816027	4 - 17A		9A- 8	4138336	12 - REF	4703276	6 - 1
1816028	4 - 17A	2582954	1 -158A	4138338	1 -182	4703277	9A- 30
1816039	5 - 6		2 -184		12 - REF	5054290	2 -181
1819730	11 - 37	2594759	12 - 28	4138339	1 - 89	5054292	2 -181
1819731	2 - 83	2637682	12 - 19	4138340	1 -117	5054294	2 -181
	11 - REF	2637689	12 - 71	4138341	1 -104	5054296	2 -181
1819733	2 - 86	2638059	5 - 91	4138342	1 -114	5054478	2 -181
1819739	1 -183	2648906	10 - 1	4138343	1 -115	5054480	2 -181
	12 - REF	2731852	12 - 29	4138344	1 -113	5054482	2 -181
1819740	2 - 66	2744813	12 - 32	4138345	1 -102	5054484	2 -181
	10 - REF	2744814	12 - 58	4138346	1 - 42	5054488	2 -181
1819755	2 -144	2766709	10 - 41	4138347	1 - 71	5054490	2 -181
1819756	2 -162	4037302	12 - 60	4138348	1 -226	5054492	2 -181
1819757	11 - 30	4119489	9 - 76	4138349	1 - 62	5054494	2 -181
1819762	2 - 37	4119491	9 - 23		1 - 67	5054496	2 -181
1819763	1 - 81	4119618	1 -159		1 -219	5054498	2 -181
	1 -127	4124485	12 - 35	4138350	1 -213	5213276	4 - 13
	1 -199	4134350	2 -181	4138351	1 -225		4 - 33
	1 -240	4134959	1 -22A	4138352	1 -224		4 - 73
1819764	1 - 26	4134960	1 - 24A	4138353	1 -206		5 - 68

PART NO.	LIST AND INDEX NO.	PART NO.	LIST AND INDEX NO.	PART NO.	LIST AND INDEX NO.	PART NO.	LIST AND INDEX NO.
5214000	9 - 14	5576646	3 -139	5733161	2 - 64 A		
	9A- 7	5576663	1 -180	5762057	9 - 96		
5214073	9A- 44	5576664	3 -119	5784857	8 - 28		
5214366	9 - 69	5576666	1 - .17	5800634	12 - 36		
5214505	9 - 68	5576667	3 - 63	5820539	8 - 7		
	9A- 43	5576670	1 -118	5824095	10 - 12		
5214572	12 - 31	5576671	1 -186	5864584	9 - 62		
5214573	5 - 87	5576672	1 -227	6808518	1 -138		
5236656	9 - 22A	5576673	3 -116 A	6808520	4 - 43		
	9 - 75A	5576677	1 -171		6 - REF		
5240513	9 - 97	5576678	1 -183	6808521	1 -112		
5252526	9 - 66		12 - REF	6808527	3 - 15		
	9A- 41	5576679	1 -171		3 - 52		
5252740	9 - 67	5576687	12 - REF	6808528	8 - 25 B		
	9A- 42	5576689	9 - 91	6808537	3 -115A		
	11 - 16		9A- 70	6808541	10 - 2		
5252809	11 - 3		12 - REF	6808542	2 -179		
5252810	11 - 12	5576690	9 - 92	6808543	2 -179		
5252839	9 - 83		9A- 69	6808547	1 -171		
5252841	1 -156		12 - REF	6808548	2 -179		
5252850	9 - 30	5576691	10 - 10	6808566	1 - 30A		
5257443	3 - 40		12 - REF	6808567	1 - 24		
5270314	9 - 21	5576696	1 -134	6808568	1 - 28		
	9A- 13	5593412	12 - REF	6808569	1 - 46		
5276701	9 - 31	5593415	10 - 39	6808579	1 -148		
5312656	3 - 62	5593416	10 - 38	6808585	1 -138		
5318966	9 - 72	5593418	2 - 98	6808586	3A- 21		
5318968	9 - 73	5593422	11 - 47	6808587	3A- 21		
	9 - 74	5593430	3 -116	6808588	3A- 21		
5323562	9 - 70	5593433	2 -151	6808593	1 -137 A		
5325562	9A- 47	5593434	3A- 12	6808596	2 -185		
5353851	9 - 17	5593435	3A- 13	8029971	9 - 49		
	12 - 33A	5593438	3A- 14		9A- 27		
5353852	9 - 18	5593440	3A- 4	8330332	1 - 88		
	12 - 34A	5593441	3A- 15	8525989	9 - 75		
5353853	12 - 33	5593443	3A- 20		9A- 39		
5353854	12 - 34	5593446	1 -159				
5353868	12 - 62	5593447	3 -115A				
5353880	12 - 64	5593448	1 - 12				
5353896	12 - 65		3A- REF				
5353922	12 - 35	5593453	10 - 20				
5362301	12 - 66		12 - REF				
5362306	12 - 67	5593454	2 -172				
5404480	12 - 69	5593455	2 -166				
5412817	12 - 22	5593456	5 - 19A				
5447741	12 - 47	5593457	3 -132				
5466353	12 - 48	5593458	3 -116 F				
5466397	12 - 49	5593459	3A- 11				
5486851	12 - 50	5593464	2 -109				
5576604	5 - 16	5593465	1 - 3F				
5576606	3 - 20	5593466	1 - 3A				
	3 - 59	5593470	1 -185				
5576607	3 - 49		9A- REF				
5576609	3 -128	5593474	9A- 76				
	5 - 8	5593475	9A- 3				
5576611	3 - 12	5593476	9A- 5				
	3 - 41	5593477	9A- 48				
5576616	2 - 15	5593478	9A- 62				
5576617	3 - 67	5593479	9A- 34				
	3 - 93	5593482	9A- 10				
5576620	12 - REF		12 - REF				
5576626	2 -120	5593483	9A- 17				
5576627	2 -121		12 - REF				
5576629	2 -123	5593484	9A- 65				
5576630	2 -122	5593485	9A- 28				
	2 -124	5593486	9A- 60				
5576631	2 -125	5593487	12 - 44				
5576633	2 -139	5593488	9A- 57				
5576635	2 -116		12 - REF				
5576636	5 - 46	5593489	9A- 58				
5576637	2 - 94		12 - REF				
5576638	1 - 58	5593490	9A- 51				
5576639	3 - 23	5593492	9A- 2				
	4 - 3	5615309	11 - 20				
5576640	2 -111		11 - 27				
5576641	1 -149	5615311	11 - 25				
	12 - REF		11 - 26				
5576642	1 -152	5615592	11 - 28				
5576643	1 - 13	5615879	11 - 21				
5576644	3 -140	5616034	3 - 60				



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SECTION 21 GENERAL/TOOLS

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MAINTENANCE ANALYSIS PROCEDURES (MAPs)

The Maintenance Analysis Procedures (MAPs) are a step-by-step procedure to guide you through the service call by tracing a symptom to the cause of failure. The MAPs logically approach the possible cause of machine problems and may point you to the defective component, the necessary adjustment, or the field replaceable unit (FRU).

USING THE MAPs

When using the MAPs:

- Read Carefully. The MAPs can help you find the problem only if you follow instructions and answer questions correctly.
- Follow the Sequence. Proceed step-by-step through the MAPs at all times. At times, the MAP instructions may not seem applicable to the problem. However, they can be important in determining the failure.
- Follow Instructions. Instructions should be followed in the order given. Questions are based on instructions preceding the questions. Do not change the conditions established by the instructions before answering the questions.

Throughout the MAPs, references may be made to error indicators, second-level diagrams, service aids, or other informative material.

MAP EXAMPLE:

5211 START

PAGE 1 OF 4

ENTRY POINTS

ENTER THIS MAP			
FROM	ENTRY POINT	PAGE NUMBER	STEP NUMBER
MAP NUMBER			
0000	A	1	001

MAP Name and Number

MAP 0010-1

Entry and exit points — show all entry and exit points to and from this MAP.

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
2	005	0020	A
2	007	0022	A
3	016	0055	A
3	015	0070	A

This map is used to analyze the printer failure and direct you to the appropriate map.

001  
(Entry Point A)

Step Number

Did the system maps direct you to the 5211 printer maps?

Y N

002  
(Entry Point B)

Instruction — establishes conditions for answering the next question.

Record failure indicators from the system and operator detected symptoms.  
Inspect the printer for obvious causes of failure, such as a broken ribbon or print belt.  
If the cause of the failure is obvious, find the repair procedure in the Map Index 0000.  
Resolve printer power problems first.

Is a cable interlock problem or a printer power problem indicated?

Y = yes N = no

Y N

Off-Page Referencing — identifies the page and trace where this MAP leg continues.

4 3 2  
A B C

C ← On-Page Referencing — indicates the trace and page where this MAP leg came from.

1 5211 START  
PAGE 2 OF 4

003 Printer errors are indicated by a Check Light.  
Question — answer either yes or no. Continue from your answer to the next question or instruction.

Is the Check Light on?

Y N

004 Press the Stop/Reset key and then the Ready key.  
The Ready Light should come on and the print belt motor should start turning.

Printer set-up

1. Power is on
2. Forms are loaded
3. Print belt is installed
4. Throat is closed
5. Forms thickness control is set correctly
6. Cover closed
7. The system must be varied OFFLINE or in a DIAGNOSTIC mode

Is the Ready Light on?

Y N

005 Printer not ready.  
Go to MAP 0020, Entry Point A.

External Exit Point — indicates the MAP and entry point to go to.

006 Is the print belt motor turning?

Y N

007 Print belt motor failure.  
Go to MAP 0022, Entry Point A.

3 3  
D F

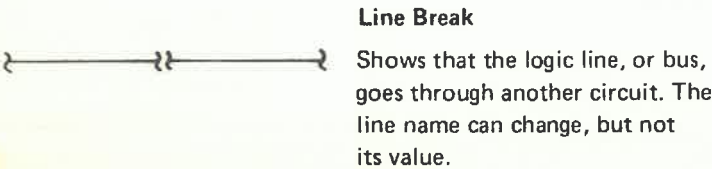
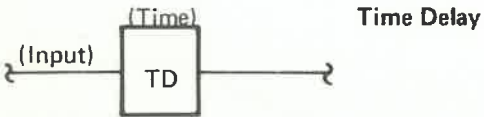
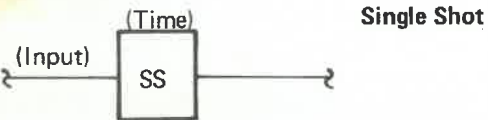
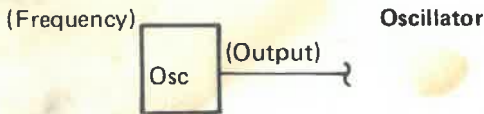
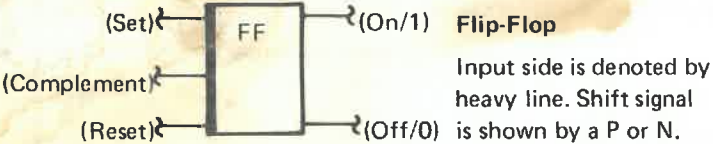
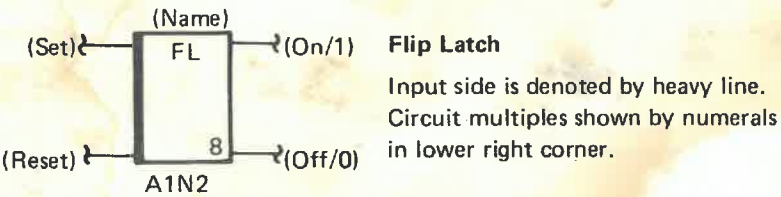


LEGEND

LOGIC SYMBOLS

Positive logic is represented in this manual, and signal levels are disregarded. The negator or inverter (N block) inverts the logic (not the level). Passive elements such as line terminators, and pulse shapers are not usually shown because they do not contribute to the logic. Wiring diagram page numbers are indicated below most logic symbols.

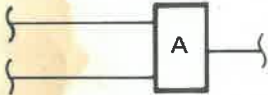
Data flow is normally from left to right and from top to bottom; flow that may be logically unclear is shown by arrows.



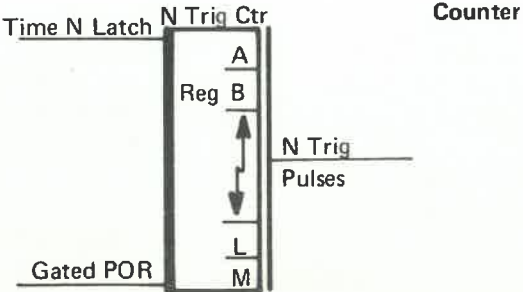
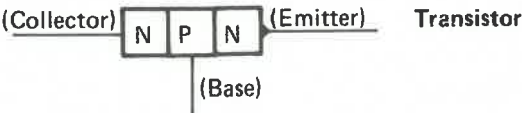
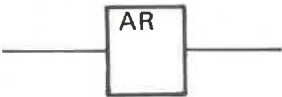
AND Block

The same basic symbol is used for other logic blocks. Each type is identified by the legend in the block, as follows:

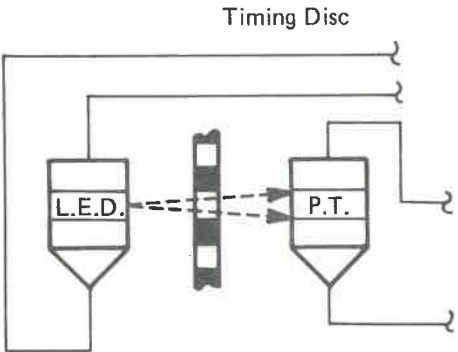
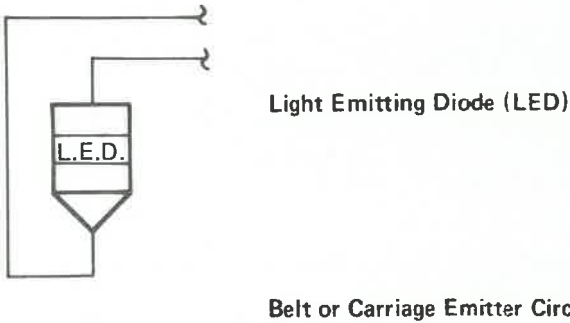
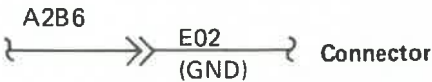
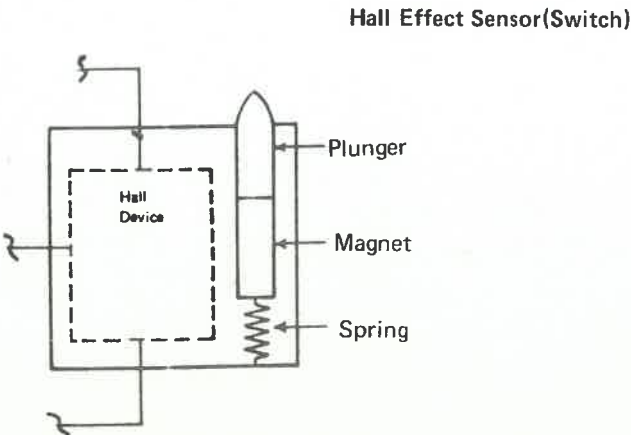
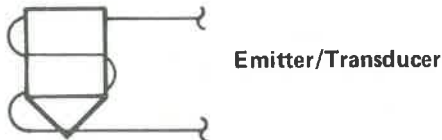
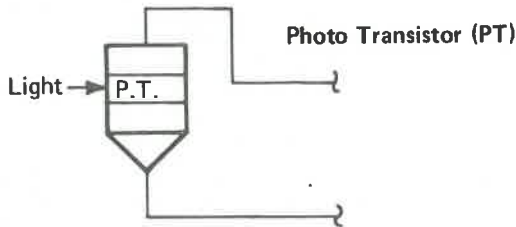
- A MD AND gate, magnet driver output
- EV even
- OD odd
- OE exclusive OR
- OR OR



**AMPLIFIER** — The amplifier (AR) provides adequate driving energy and an appropriate impedance match to other blocks. The amplifier output is active only when the input is active. An amplifier having input or output of other than standard logic signal voltage has distinctive labeling at the block.



ELECTRIC SYMBOLS



**TIMING CHARTS**

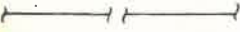
**Active State**

Numerals at the beginning and end of the bar identify the signal(s) on the same chart that activates and deactivates this line. (Not) with the number indicates that lack of the signal conditions the line.



**Line Break**

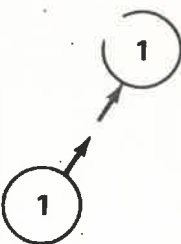
Represents an interval in time.



**KEY SYMBOLS**

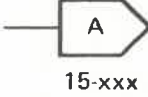
**On-Page Connector**




Indicates the connection between two parts of the same diagram. The arrow leaving the symbol points (line-of-sight) to a correspondingly numbered symbol.



**Off-Page Connector**

Indicates the connection between diagrams that are located on separate pages. The location of the correspondingly lettered symbol is shown adjacent.

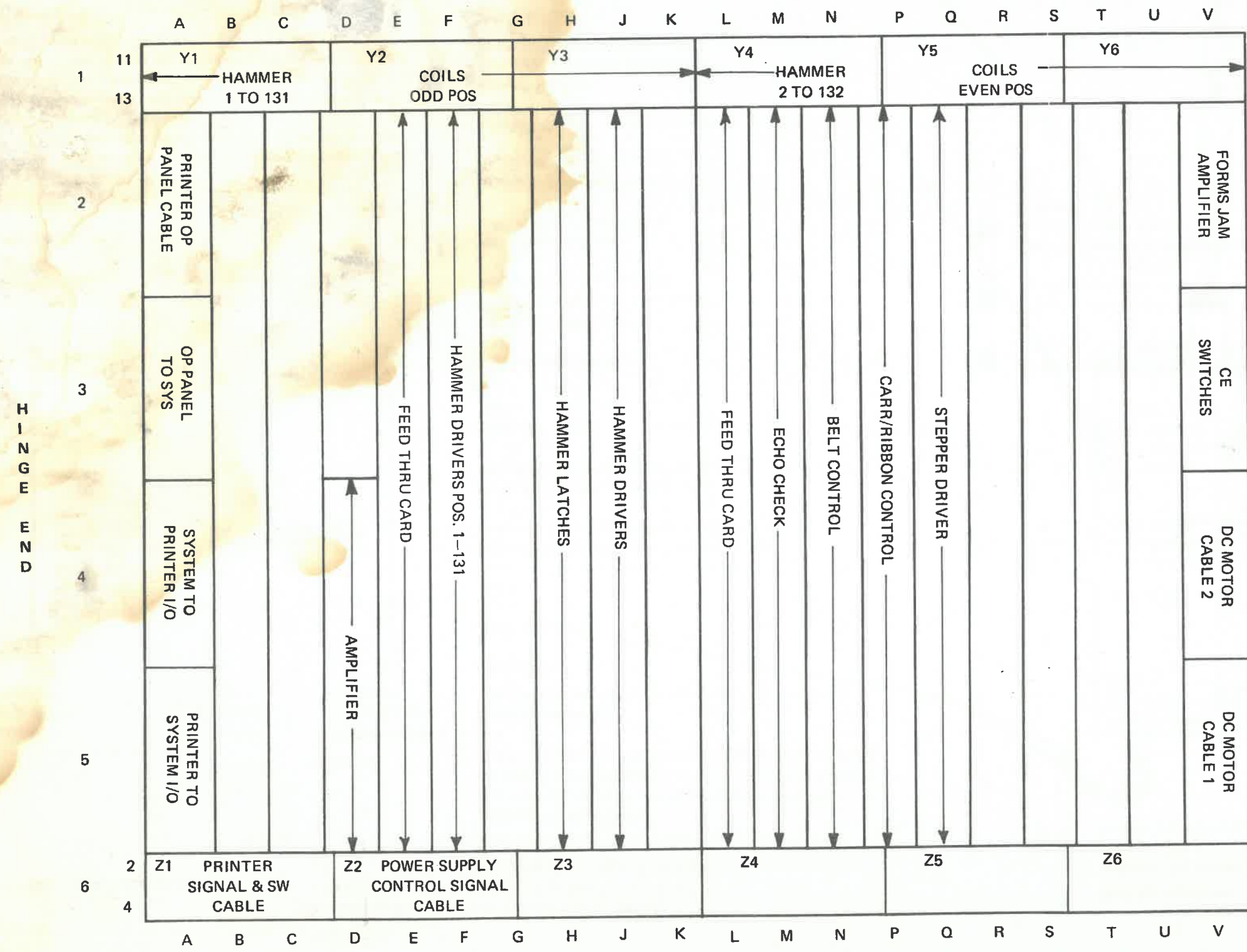


-  Denotes a reading sequence. Corresponds with a similar key in an associated diagram.
-  Denotes a reading sequence within a diagram. Corresponds with a similar key in the associated text.
-  Denotes a nonsequential reading order. Sometimes corresponds with a similar key in an associated diagram.



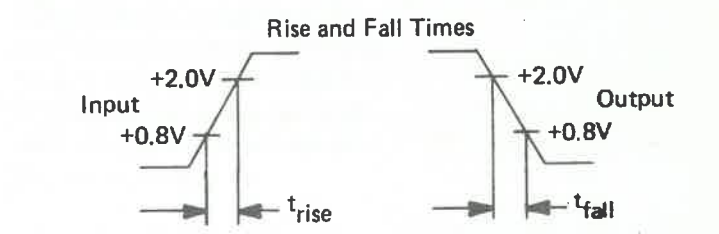
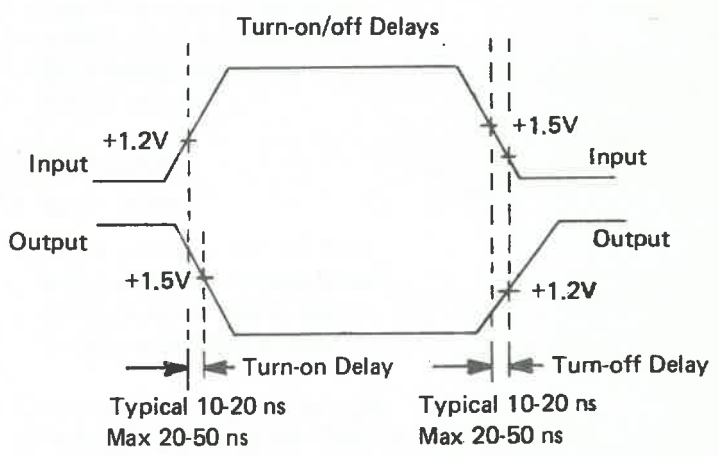
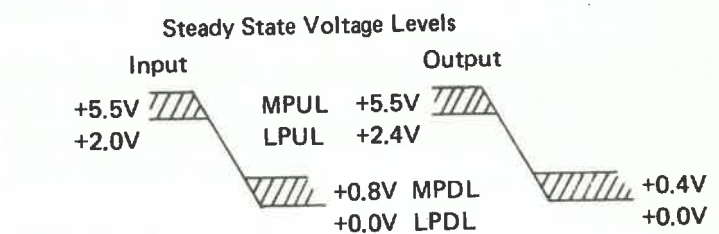
GENERAL LOGIC INFORMATION

01A-A1 BOARD LAYOUT (Example: 5211 Model 2)

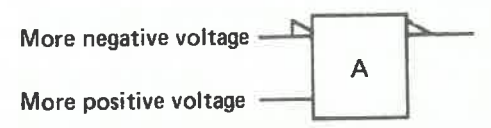


(CARD SIDE-VIEW)

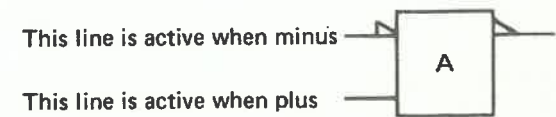
VOLTAGE SWITCHING LEVELS



**Polarity**  
Polarity is indicated by a wedge (  ) or no wedge.

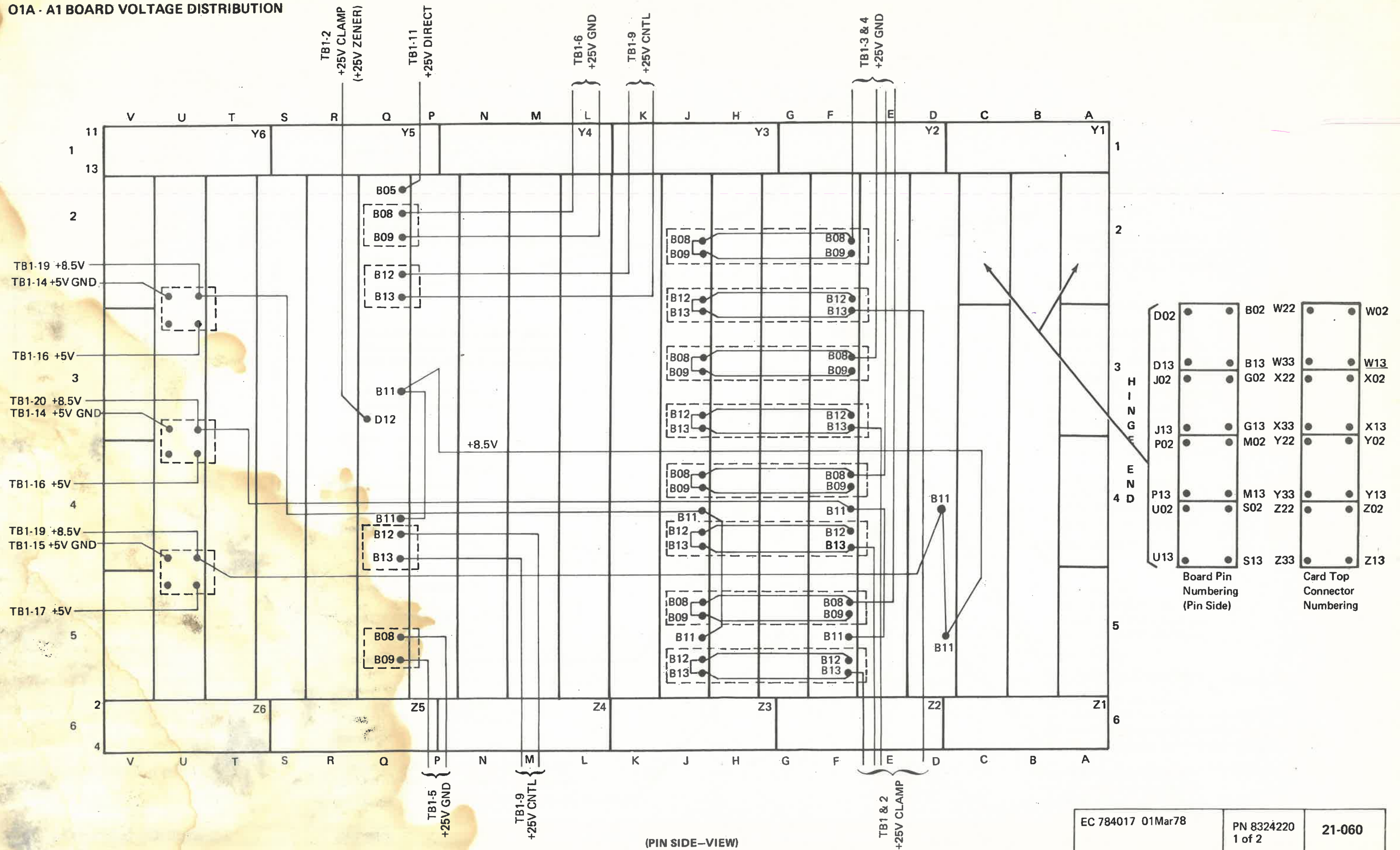


**Active Level**  
Active level is the line level that conforms to the edge-of-block character for that line.





O1A - A1 BOARD VOLTAGE DISTRIBUTION



TOOLS AND TEST EQUIPMENT

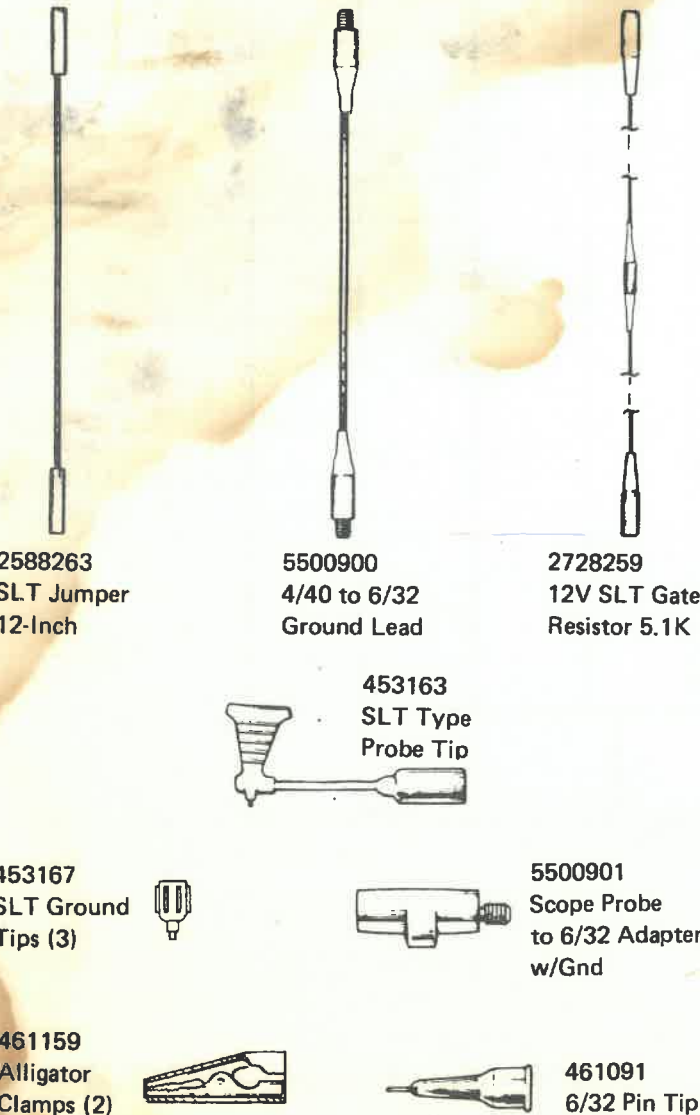
GENERAL LOGIC PROBE II (GLP)

Description

The IBM General Logic Probe II **A** is a small, rectangular, hand-held unit used by the Customer Engineer to detect logic signals for many technologies. It is designed for use on all new IBM machines that need a logic probe for maintenance. It replaces the old SLT type logic probe.

For a detailed description of the GLP Operation, specifications, and maintenance, see IBM GENERAL LOGIC PROBE II MANUAL, SY27-0127.

Accessories



Operation

**Ground Lead**  
Connect this lead to any signal ground (D08 pin) near the probe point. Do not use frame ground.

CAUTION

Improper indications result if this lead is not connected to signal ground.

Indicator Lights

UP indicates an up level (+).  
DOWN indicates a down level (-).

A pulsing line is indicated by both lights being on.

Both lights are off if the line level is from +1.0 Vdc to +2.0 Vdc for MULTI logic setting.

Safe Operating Ranges:

	MULTI	+60.0V
Logic	MST 2/4	+14.0V
Selector	MST 1	+14.0V

Voltages greater than the above ranges will damage the probe.

Probe UP and DOWN lights will momentarily flash on during power up if the probe is connected to its machine power source. Please ignore.

Power Leads

CAUTION

Improper connection of the power lead might cause the probe to malfunction.

Connect the black (-) power lead to M2D08 (gnd). Connect the other (+) lead to M2D03. A voltage difference of 4V to 12V is needed to power the probe, with the black lead always the most negative.

*Note:* The power leads (+) D03 and (-) D08 can be connected to any card row on the 01A1 Board, EXCEPT the A and V rows.

General Logic Probe II  
(part 453212)

**Test Terminal**  
The line being probed is connected to this terminal. (Various probes may be attached, other than the one shown, to aid in probing.)

**Extender (part 453605).** The extender is a 24 inch (60 cm) long probe that allows the general logic probe to be used more conveniently. The extender is ordered separately from the general logic probe.

Logic Selector (TECHNOLOGY)

- 5211: MULTI  
Selects the type of logic to be probed. Circuits probed in the 5211 Printer require the MULTI setting.

LATCH Switch

- 5211: NONE  
NONE position resets the lights and prevents any latching action. This position is used for most probing in the 5211 Printer

The up position allows satching the UP light on a positive pulse. The down position allows latching the DOWN light on a negative pulse. This feature can be used to monitor for an intermittent error condition or to verify that a pulse occurred when the operator could not continuously see the probe.

GATE REF Volts Switch

- 5211: GND  
This switch affects only the gating terminals and is not required for probing the 5211 Printer.

GATING Terminals

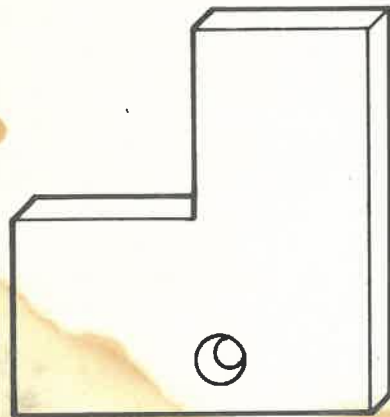
These terminals are not required for probing the 5211 Printer.



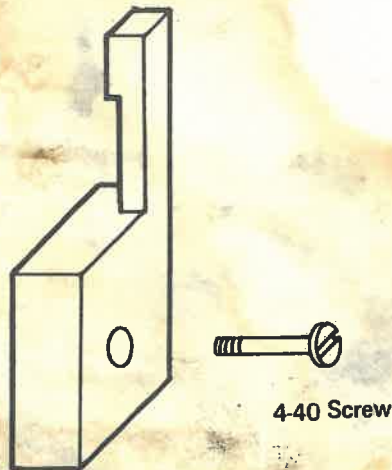
**GAUGES**

- B/M 1815365 contains the following tools:  
Platen Gap Gauge (1) Part 1814638  
Platen-to-Casting Gauge (2) Part 1815362  
4-40 Screws (2)

*Platen Gap Gauge (part 1814638)*



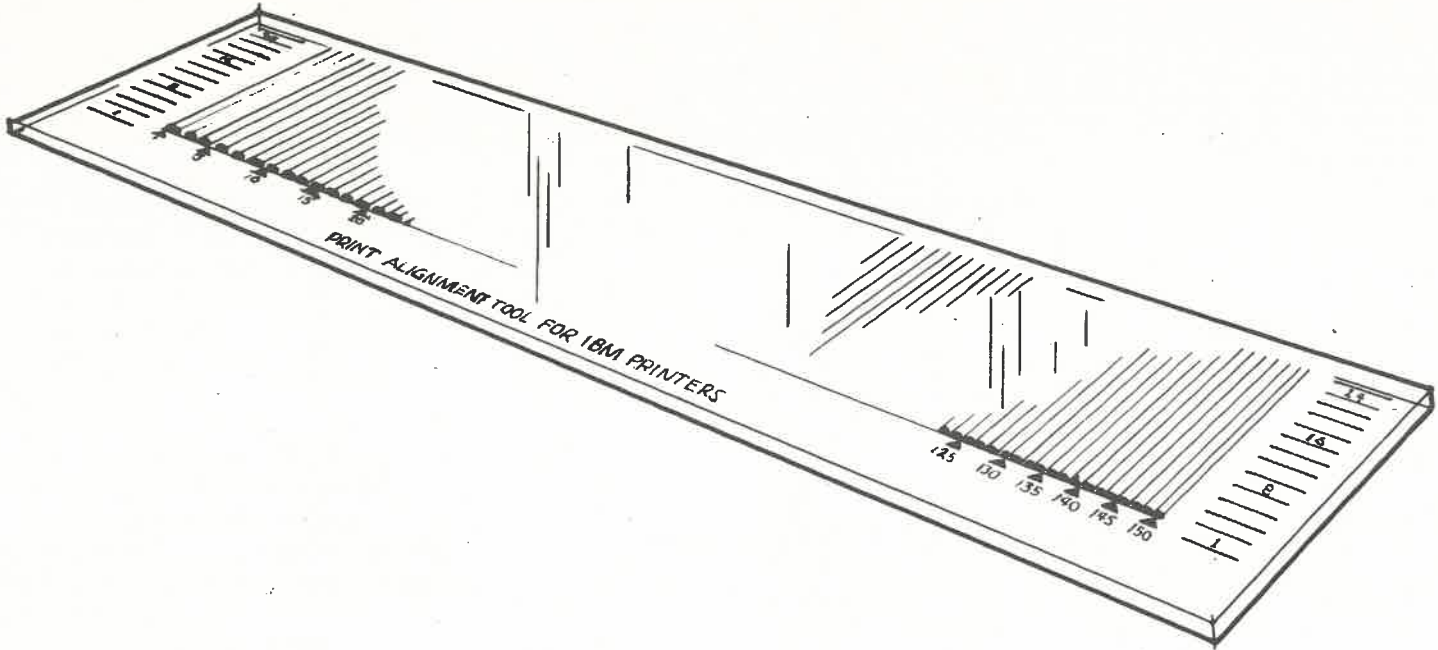
*Platen-to-Casting Gauge (part 1815362)*



4-40 Screw

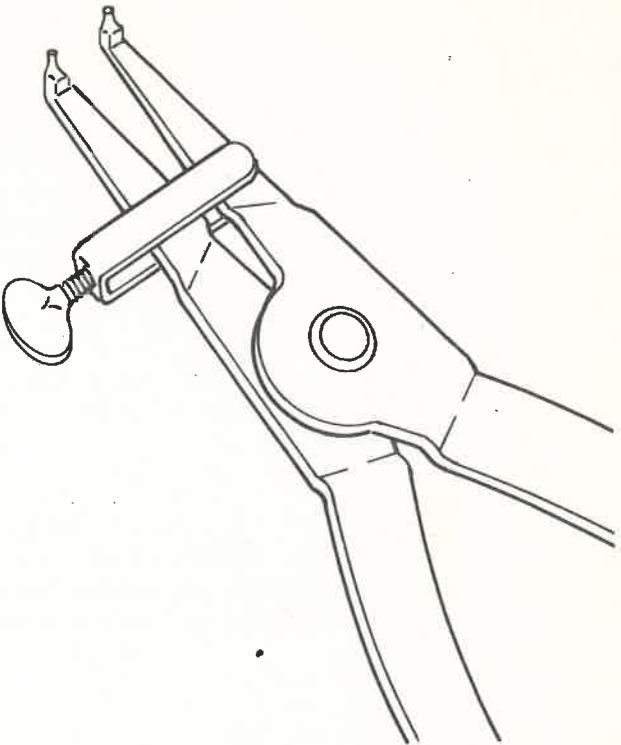
*Print Registration Gauge (part 2360173).*

*Note:* This is a Branch Office Tool and will not be found at the 5211 site.



**MISCELLANEOUS**

*Snap-Ring Pliers (part 9900317)*



*Wire Removal Tool (part 453705).* This tool is used to remove wires from the printer's connector blocks.



*Bulb Extractor (part 461061)*  
For Indicator Lights on the Operator's Panel.

*Note:* These Tools and Gauges are not included in the 5211 Shipping Group. They must be ordered separately.



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GLOSSARY OF TERMS AND ABBREVIATIONS

A

A: Ampere, AND.  
ac: Alternating current.  
accelerate: To increase in speed. For example, the print belt motor accelerates to operating speed.  
amp: Amplifier.  
AR: Amplifier/driver.

B

BLK: Black.  
B/M: Bill of material.  
buffer: A storage device that is used to hold data for processing between the system and the printer. For example, print line buffer.  
BUTS: Belt up to speed.

C

C: Capacitor.  
carr: Carriage.  
Carriage time: The time when the carriage is moving.  
CE: Customer engineer.  
character set: One complete group of characters on the print belt.  
CK, CHK: Check.  
Closed loop: The mode of control of a stepper motor by using pulses that are generated as a result of the motor's motion (feed-back pulses). The motor is first started by an external pulse.  
cm: Centimeter.  
CNTL: Control.  
compartment: A designated space such as "stacker compartment".  
Conn: Connector.  
Ctr: Counter.

D

D: Diode.  
dc: Direct current.  
detent: A device used to position and hold one mechanical part in relation to another so that the device can be overridden by using additional force. On the 5211, an electrical detent is used to hold the carriage mechanism in place when it is not moving the forms.  
diagram: Figure.  
drag: The force put on the ribbon or forms to keep tension on them. See also ribbon drag.

E

E: Emitter.  
EC: Engineering change.  
echo: A Hammer Echo Return Signal is sent back to the System in response to each hammer-fire signal.  
EDS: Elastic-diaphragm switch.  
elastic-diaphragm switch: The switch contact is operated by a flexible key top instead of a push button. The keys used on the 5211 operator's panel are this type.  
EOF: End of forms.

F

F: Fuse.  
FCB: Forms control buffer.  
FF: Flip flop.  
Fire Tier Pulse (Fire-Time Pulse): The pulse is activated by the system to fire the group of hammer(s) that was addressed on the previous subscan. There are five separate fire-time pulses or tiers, and each tier is assigned to fire certain hammers that are aligned with characters on the belt. (1/5th of the hammers). The pulse has a variable time duration depending on the impression control single shot.  
FL: Flip latch.  
flip flop: An electronic latch having a common input that causes the status of the latch to reverse each time an input is received.  
forms chute: The forms path under the printer between the forms entry and the forms tension assembly.  
FRU: Field replaceable unit.

G

GLP: General logic probe.  
Gnd: Ground.

H

HMR: Hammer.  
Hz: Hertz.

I

IAD: Installation activity report.  
IMPSS: Impression control single shot.  
in: Inch.  
INLK: Interlock.  
IPO: Instant power off.  
IR: Incident report.  
I/O: Input/output.

K

kHz: Kilohertz.  
K: Relay or contactor.

L

LED: Light emitting diode.  
LPI: Lines per inch.  
LPUL: Least positive up-level.  
LRS: Lower ribbon shield.

M

M: Motor.  
mA: Milliampere.  
MAPs: Maintenance analysis procedures.  
max: Maximum.  
MHz: Megahertz.  
MIM: Maintenance information manual.  
min: Minimum.  
mm: Millimeter.  
monitor: To verify some specific function(s) such as the frequency of P.S.S. pulses.  
MPUL: Most positive up-level.  
ms: Millisecond.  
MST: Monolithic system technology.  
MUTS: Motor up to speed.

N

N: Negator, no, negative.  
N/O: Normally open.  
ns: Nanosecond.

O

OP: Operator.  
open loop: The mode of control of a stepper motor that uses pulses from an external source, such as an oscillator.  
option: To make available.  
OSC: Oscillator.  
oz: ounce.

P

P: Positive, plug, connector  
Paper clamp: An electromechanical device used to hold the forms firmly in position during printing.  
PED: Pedestal.  
pedestal: A circuit that provides control of a common voltage to a driver circuit such as a carriage pedestal driver.  
phototransistor(PT): An electronic device that switches voltage when light hits the light-sensing part of the device.  
pitch: The distance between hammer positions or characters on the print belt. It is expressed as a rate, such as 10 hammers per inch.  
PLB: Print line buffer.  
PM: Preventive maintenance.  
POT: Potentiometer.  
POR: Power on reset.  
POS: Position.  
Print Belt (Typebelt): The belt is a steel band that has the type characters etched near the top and timing marks near the bottom.  
Print Scan: The time for the print belt to move the physical distance between each character. A print scan has 5 subscans. scan has 5 subscans.

Print Subscan (PSS) Pulses: Two PSS pulses are generated from each timing mark on the print belt. The pulses occur in sequence (subscan 1 through subscan 5, then repeated). Five subscans make up one print scan. The pulses are used by the using system to synchronize the characters on the print belt to the correct hammer for addressing and firing. Each print subscan is assigned the certain group of hammers that are in alignment with the characters on the belt. (1/5 of the total hammers)  
Print time: The time when print scans are occurring.  
PS (P/S): Power supply.  
PSS: Print subscan.  
PT: Phototransistor.

R

R: Resistor.  
Reg: Register.  
restraint: Something that limits movement.  
Ribbon drag: The force put on the ribbon by the non-driving ribbon motor to keep tension on the ribbon.

S

slew: A mode of stepper motor control. See closer oop.  
SLT: Solid logic technology.  
SS: Single shot.  
Stepper Motor: A motor that is phase-controlled by dc pulses or "steps". The motor turns when it is pulsed, and stops turning when it is not pulsed.  
sw: Switch.  
sys: System.

T

t: Time.  
TB: Terminal board/block.  
TD: Time delay.  
throat: The opening where the forms pass between the print unit casting and the hammer unit. On the 5211, when the print unit casting is closed and the print unit interlock is actuated, the signal 'throat closed' is sent to the system.  
tinsel: A cord having metal strips that is used to decrease the electrostatic charge on the forms before stacking.  
TP: Test point.  
trig: Trigger.



**U**

**UCSB:** Universal character set buffer.

**URS:** Upper ribbon shield.

**UTS:** Up to speed.

**V**

**V:** Volts, voltage.

**VOM:** Volt-ohm-meter.

**V1:** Volume 1.

**V2:** Volume 2.

**W**

**W:** Watts.

**Y**

**Y:** Yes.

**YEL:** Yellow.

$\mu$  micro  
 $\mu f$  microfarad  
 $\mu s$  microsecond



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